THE ANNA CITY
CODE OF ORDINANCES

PART III - B

(DESIGN STANDARDS)

Current through February 12, 2013

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Section 1. GENERAL REQUIREMENTS

1.1 Introduction:

The "Design Standards and Specifications Manual" is designed to implement the provisions of the Subdivision Ordinance and to provide for the orderly, safe, healthy and uniform development of the area within the corporate city limits and within the area surrounding the City, extraterritorial jurisdiction (ETJ).

The 4th Edition of the NCTCOG Standard Specifications for Public Works Construction dated October 2004 as modified by the City of Anna Special Provisions are supplemental and are made a part of these Design Standards. These documents are to be considered as the minimum requirements of engineering design. The adherence to the requirements of these documents and/or the approval by the City of Anna and its agents in no way relieves the developer of the responsibility for adequacy of design, which may require more stringent standards than these, the completeness of plans and specifications or the suitability of the completed facilities. In unusual circumstances, the City of Anna may determine that designs other than those of the Standards are necessary and will inform the developer of such requirements before final engineering review.

The developer shall obtain authorization from the City of Anna, in writing, for any deviations from the requirements set forth in the Design Standards and Specifications Manual.

1.2 Standards of Design:

The Design Standards, as adopted by the City of Anna, are set forth herein. These standards shall be considered as the minimum requirements, and it shall be the responsibility of the developer to determine if more stringent requirements are necessary for a particular development. It is not intended that the Design Standards cover all aspects of a development. For those elements omitted, the developer will be expected to provide designs and facilities in accordance with good engineering practice and to cause the facilities to be constructed utilizing first class workmanship and materials.

1.3 Standard Specifications for Construction:

The City of Anna Special Provisions to the NCTCOG Standard Specifications for Public Works Construction as adopted by the City of Anna is referenced in this document. The Standard Specifications for construction set forth the minimum requirements for materials and workmanship for streets, parking lots, sidewalks, drainage, water, and wastewater systems. These specifications should be considered as minimum requirements and such additional requirements as the developer of the City may consider appropriate should be added as supplements.

1.4 Standard Details:

In an effort to have uniformity and to facilitate maintenance, the City has adopted the North Central Texas Council of Governments (NCTCOG) Standard Drawings as modified by the City of Anna Special Provisions for certain facilities such as manholes, street sections, sidewalks, water, wastewater, storm water, curb inlets, barrier free ramps, etc. The City of Anna Special Provisions to the NCTCOG Standard Details are located in Section 9 of this document. The NCTCOG Standard Specifications can be obtained from the North Central Texas Council of Governments at 616 Six Flags Drive, Suite 200, Arlington, Texas, 76005, (817) 640-3300.

1.5 Materials Testing and Quality Control

Testing of materials and quality control for all development construction shall be performed by an approved materials testing laboratory and payment for such services shall be made by the contractor. The City Engineer shall approve the testing laboratory nominated to perform the service. It is the contractor's responsibility to show, through test procedures and results, that the work is in conformance with these design standards. All testing shall be completed with an employee or representative of the City of Anna present.

1.6 Utilities to be Underground:

All utilities within a residential development shall be placed underground. Utilities are defined for this purpose as water pipelines, wastewater pipelines, storm water pipelines, natural gas pipelines, telephone wires, cable TV wires and electric wires. In case of special or unique circumstances, the City may grant variances or exceptions to this requirement. Any request for variance or exception should be submitted in writing to the City of Anna setting forth the justification for an exception. The granting of a variance or exception by the City will be in writing. No work will be accepted without written approval from the Director of Public Works or City designee, or in the case of franchise utilities, the City Council. Commercial developments may have overhead utilities as approved by the City.

1.7 Submittal to Utility Companies:

The developer shall be responsible for submittal of information needed to design private utilities for the development. This information shall be submitted to TXU-Electric, ONCOR, Southwestern Bell, ATMOS-Gas, the cable TV franchise and any other appropriate utility.

Written confirmation shall be submitted with the final engineering drawings, verifying that the affected Utility companies have reviewed the final plat and easement description and agree that the easement locations and sizes are adequate and consistent with the design requirements of the utilities.

1.8 Requirements of the Final Engineering Drawings:

The final engineering drawings will consist of drawings showing all information necessary to completely review the engineering design of improvements proposed for or affected by the site and sealed by a Registered Professional Engineer, licensed in the State of Texas.

1.9 Final Acceptance:

After improvements have been constructed, the developer shall be responsible for providing to the City "As Built" or "Record Drawings" mylars and one (1) set of "Black line prints". The City will not accept the subdivision until the mylars and prints are submitted to the City. Mylars and prints shall be sized 22" x 34". The City shall also be furnished pdf images of each sheet named according to the sheet title and sheet number and AutoCAD 2010 or later format drawings on a CD-ROM (No XREFS) of the "As Built" or "Record Drawings" (digital).

1.10 Warranty

As a condition of final acceptance the contractor shall furnish a two (2) year maintenance bond in the amount of 100% of the public improvements, which shall become effective from the date of acceptance.

Section 2. STREETS

2.1 General:

The street system, including the street layout, shall be in accordance with generally accepted engineering practices and in compliance with the Comprehensive Plan, the latest Thoroughfare Plan, the Zoning Ordinances, the Subdivision Regulations and other applicable regulations. The plans and specifications, and other applicable data, shall be submitted to the City for review. Construction shall not commence prior to approval of the plans and specifications by the City. All changes during construction shall be submitted to the City's Engineer for approval and acceptance by the City prior to any construction modifications.

2.2 Street Arrangement:

Unless otherwise approved by the City, provisions shall be made for the extension of existing major arterials, collector streets and local streets in accordance with the Thoroughfare Plan and any specific street alignments as adopted by the City Council.

Off-center intersections will be considered for approval only for minor collector and local streets, and only when there is a minimum center line separation of 125', unless otherwise approved by the City's Engineer.

Within residential areas, the following design elements are encouraged: (A) Developing only a limited number of access points to arterial streets bordering the subdivision; (B) Incorporating curvilinear streets into the plan; (C) More than one point of access; and (D) Incorporating a discontinuous residential street network, which

utilizes three-way intersections in lieu of four-way intersections. When these factors are incorporated into a residential street plan, the result is enhanced character and traffic safety.

Geometric design standards are presented in two formats within this section. Table 2.1 identifies specific design criteria for each standard roadway type. Figure 2.1A and 2.1B shows the typical cross-section for each standard roadway type. It is noted that dimensions shown are to the back of curb, unless specifically identified otherwise.

Each roadway type is keyed to the City Thoroughfare Plan, with the exception of local streets. The reader is referred to this document for information as to the locations where these roadways are to be used.

2.4 Turn Lanes:

All left turn storage areas shall be ten (10) feet wide with minimum storage requirements for left-turn lanes as in Figure 2.2. The transition curves used in left-turn lanes shall be two (2), 250-foot radius reverse curves with a total transition length of 100 feet.

TABLE 2.1

GEOMETRIC DESIGN STANDARDS

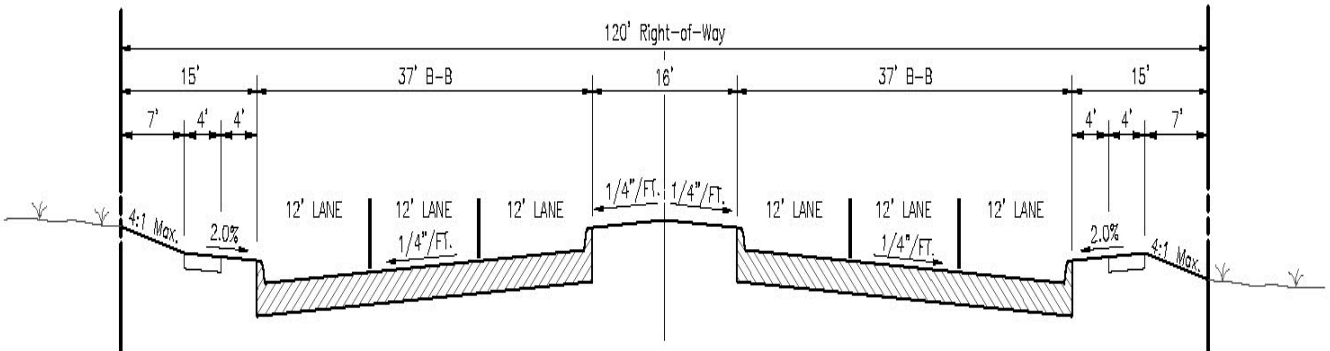
Design Element	Principal Arterial Divided	Minor Arterial Divided	Major Collector Undivided	Minor Collector Undivided	Local (Residential)
Number Traffic Lanes	6	4	4	2	2
Minimum Lane Width (Feet)	12	12	11	11 + 2 Parking	15
Minimum R.O.W. Width* (Feet)	120	80	80	60	50
Design Speed (M.P.H.)	45	40	40	40	40****
Stopping Sight Distance (Feet)	400	325	325	325	325
Median Width ** (Feet)	16	14	--	--	--
Minimum Lateral Clearance (Feet)	6	6	6	6	--
Parking Permitted	NO	NO	NO	Com. Some Res. Yes	Res. Yes
Minimum Horizontal Centerline Curvature (Feet)	1200	850	Com. 700 Res. 600	Com. 500 Res. 350	Res. 200 ELBOW – 50’

* **RIGHT-OF-WAY REQUIREMENTS FOR STATE HIGHWAYS AND/OR THE PROVISION OF RIGHT TURN LANES OR OTHER INTERSECTION IMPROVEMENTS MAY EXCEED THIS MINIMUM R.O.W. STANDARDS**

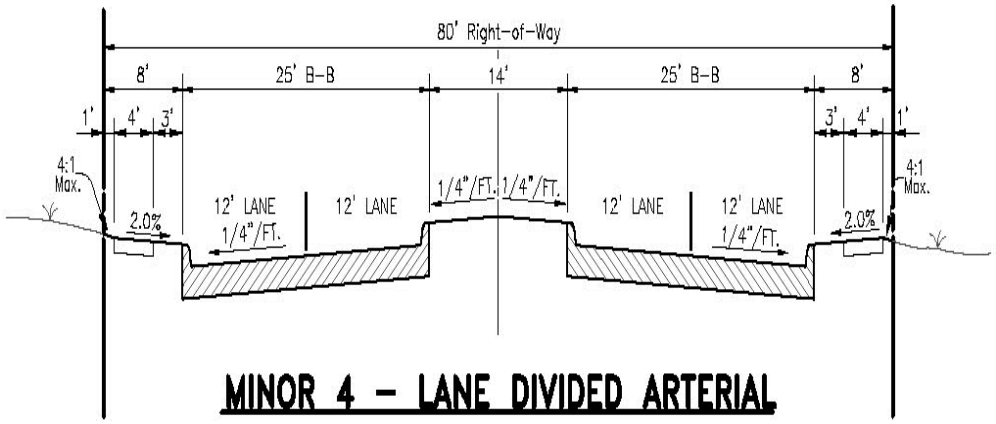
** **LARGER MEDIANS MAY BE REQUIRED TO PROVIDE FOR MULTIPLE TURN LANES.**

*** **LOCAL RESIDENTIAL CUL-DE-SACS SHALL HAVE A MINIMUM R.O.W. RADIUS OF FIFTY FEET (50’).**

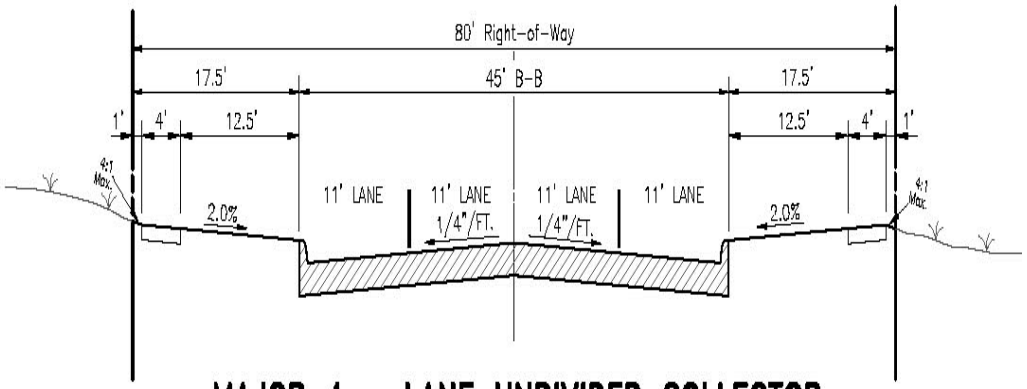
**** **A LOWER DESIGN SPEED MAY BE USED IF, IN THE JUDGEMENT OF THE CITY’S ENGINEER, SITE FEATURES (TOPOGRAPHY, STREET PATTERN, ETC.) DICTATE. IN NO CASE SHALL THE DESIGN SPEED BE LOWER THAN 20 MPH.**



PRINCIPAL 6 - LANE DIVIDED ARTERIAL

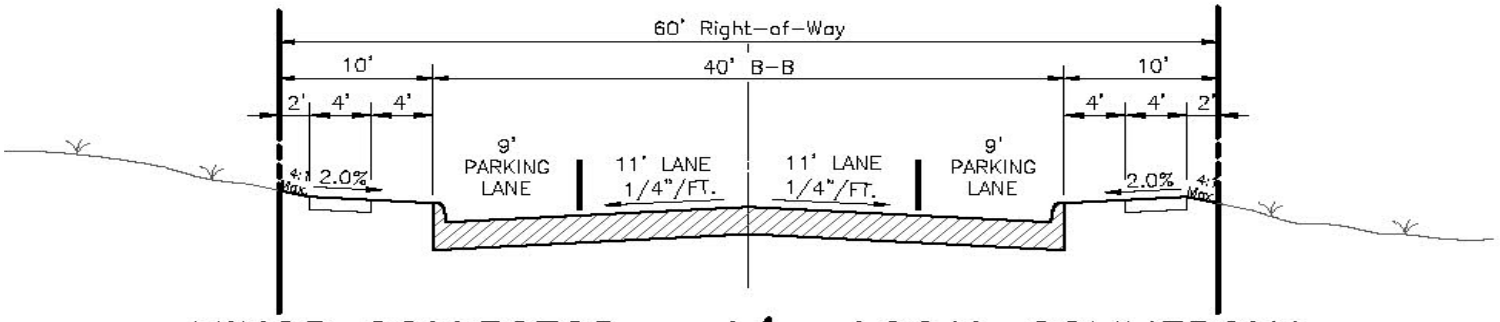


MINOR 4 - LANE DIVIDED ARTERIAL

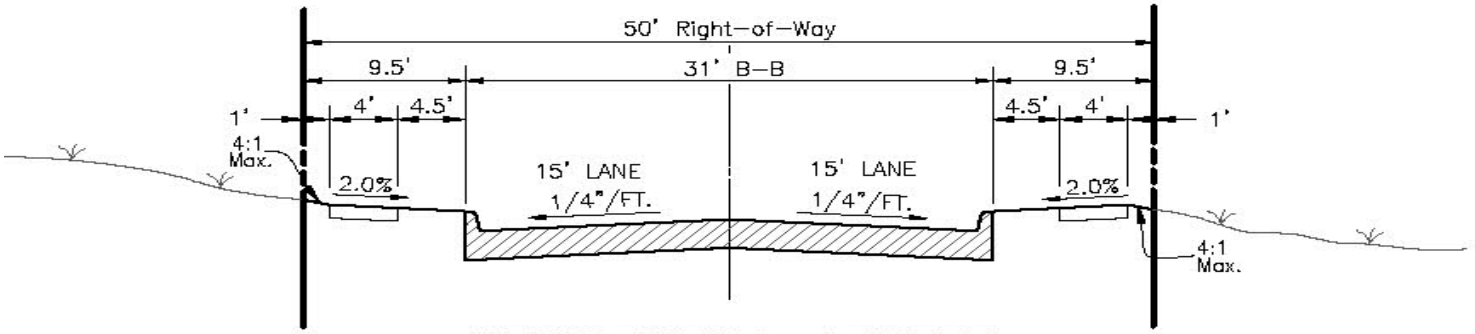


MAJOR 4 - LANE UNDIVIDED COLLECTOR

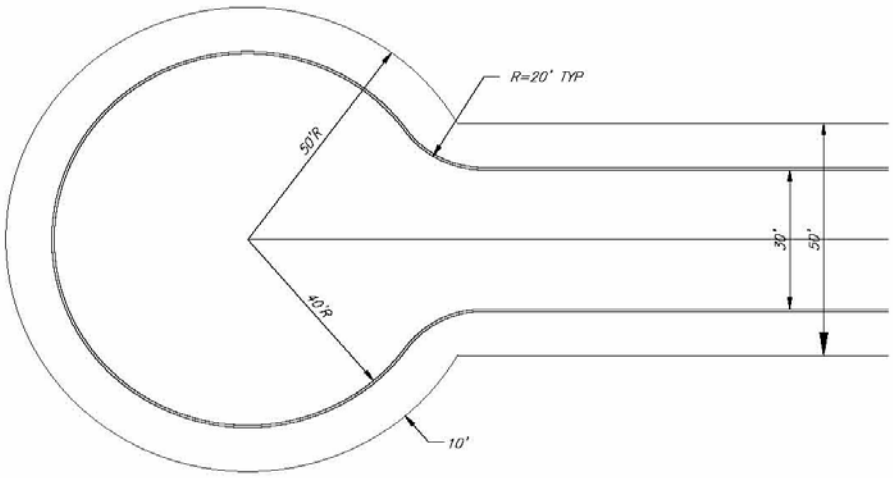
FIGURE 2.1A



MINOR COLLECTOR and/or LOCAL COMMERCIAL



RESIDENTIAL STREET

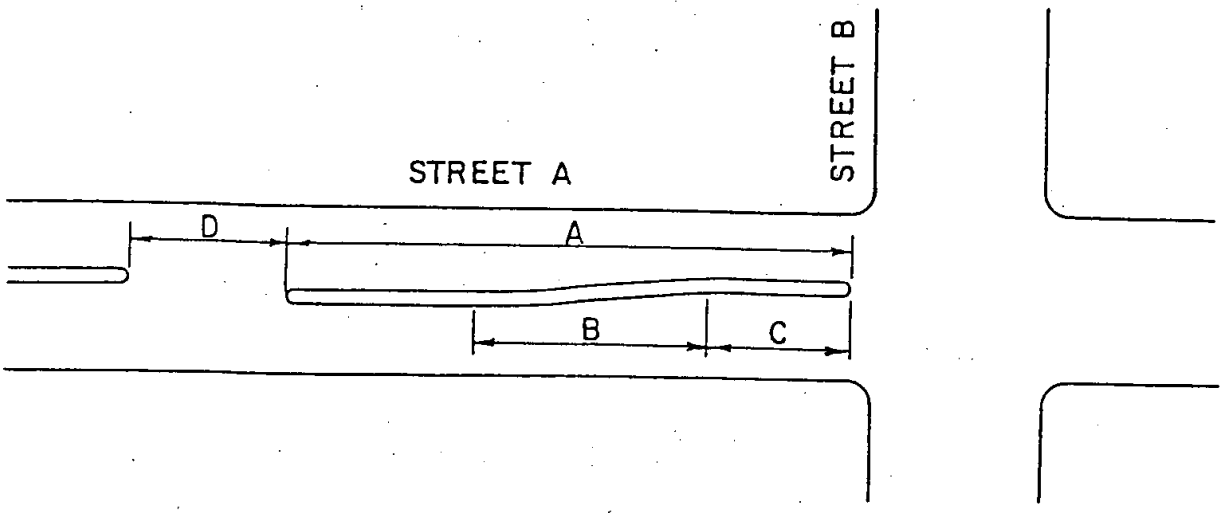


TYPICAL CUL-DE-SAC PLAN VIEW

FIGURE 2.1B

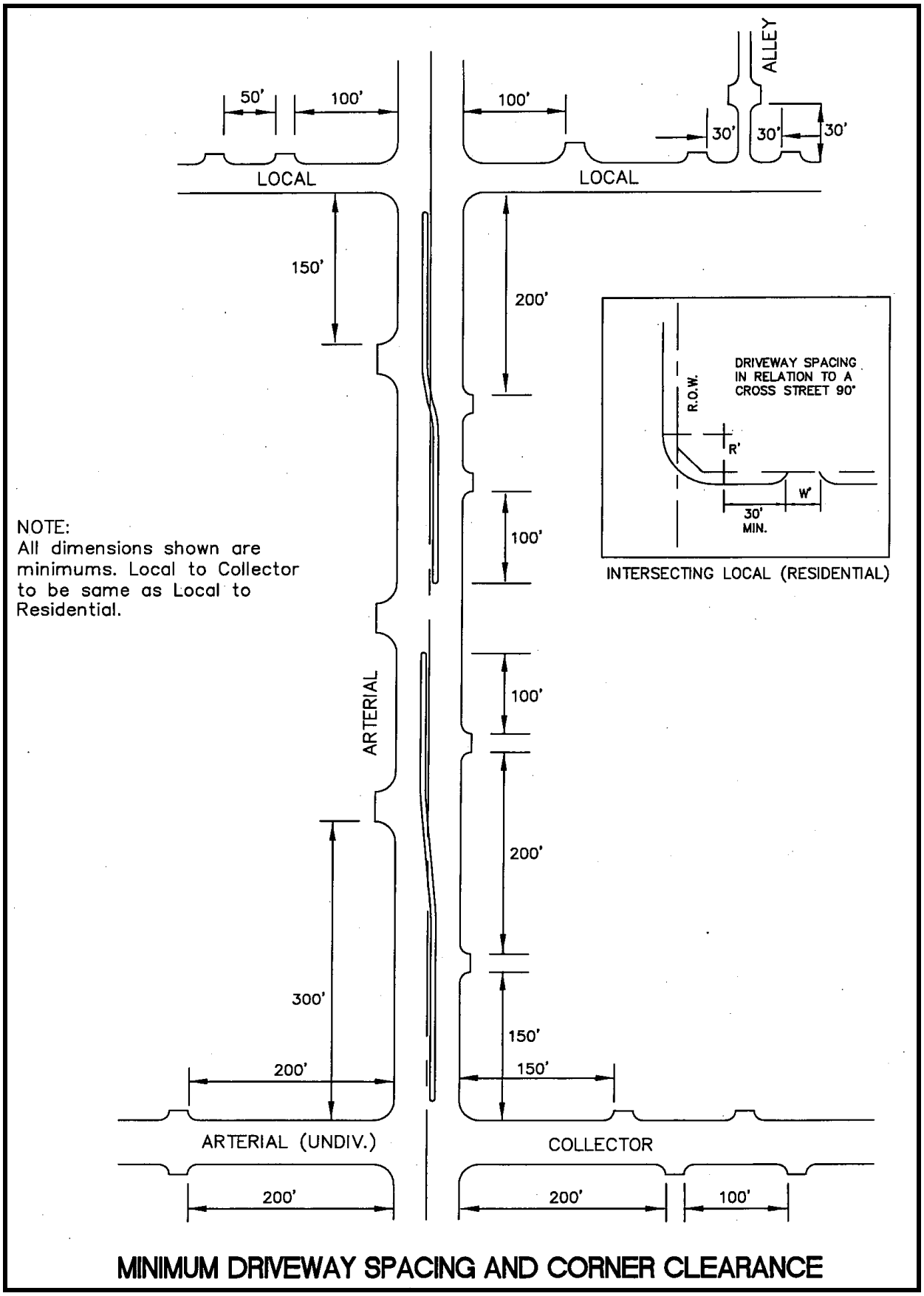
FIGURE 2.2

MEDIAN DESIGN STANDARDS



INTERSECTING STREET TYPE		MINIMUM LENGTH (FEET)			
STREET A	STREET B	A	B	C*	D**
Principal Arterial	Principal Arterial	310	100	150	60
Principal Arterial	Minor Arterial	260	100	100	60
Principal Arterial	Major Collector Minor Collector	260	100	100	60
Principal Arterial	Local/Private	220	100	60	60
Minor Arterial	Principal Arterial	310	100	150	60
Minor Arterial	Minor Arterial	260	100	100	60
Minor Arterial	Major Collector Minor Collector	260	100	100	60
Minor Arterial	Local/Private	220	100	60	60

LEFT-TURN STORAGE AREA WIDTH 10' MINIMUM
MEDIAN WIDTH (SEE GEOMETRIC DESIGN STANDARD FOR PRINCIPAL AND MINOR ARTERIAL).
***MINIMUM LENGTH – ACTUAL LENGTH DEPENDENT UPON ANTICIPATED TURN VOLUMN**
** **OR STREET WIDTH + 8 FEET – WHICHEVER IS GREATER**



MINIMUM DRIVEWAY SPACING AND CORNER CLEARANCE

FIGURE 2.3

2.5 Median Openings, Width, Location and Spacing:

Arterial thoroughfares in Anna are to have raised medians. Arterials having single lane two-way left turn lanes are discouraged and may be allowed only in special circumstances with the approval of the City Council.

Median openings at intersections shall be from right-of-way to right-of-way of the intersecting street, unless otherwise approved by the City's Engineer.

The width of mid-block median openings shall not be less than 60 feet, or greater than 70 feet.

Using the above requirements, examples of the minimum distance between median openings on a divided street where left-turn storage is provided in both directions are:

A. 310 feet from nose to nose of the median from the intersection of two major thoroughfares to a street or drive (see Figure 2.2);

B. 260 feet from nose to nose of the median from the intersection of two secondary thoroughfares or a secondary thoroughfare and a major thoroughfare to a residential street or a drive, and;

C. 220 feet from nose to nose of the median for intersection combinations of drives and/or residential streets.

2.6 Driveway Locations:

Minimum standards for driveway separation accessing the same site are shown in Figure 2.3. This standard applies to all non-residential uses.

There is a minimum distance upstream and downstream from adjacent intersections within which driveways should not be located. This separation distance varies with the classification of street and is shown in Figure 2.3. This standard applies to all non-residential users.

At mid-block access points, there is a minimum distance from a median nose, within which driveways should not be located. This is shown in Figure 2.3 and is equally applicable along both major and minor arterials for non-residential uses.

2.7 Block Lengths:

In general, streets shall be provided at such intervals as to serve cross traffic adequately and to intersect with existing streets. Where no existing plats control, the blocks shall be not more than 1,200 feet in length. Block arrangements must provide access to all lots, and in no case, shall a block interfere with traffic circulation.

2.8 Street Intersections:

More than two streets intersecting at one point shall not be allowed . All streets and thoroughfares should intersect other streets and thoroughfares at an angle of ninety (90) degrees unless otherwise approved by the City's Engineer.

Arterial and collector street intersections shall have property line corner clips with a minimum tangent distance of thirty (30) feet. Residential streets shall not normally be required to have a corner clip at their intersection with other streets or thoroughfares, but a 10-foot by 10-foot sidewalk corner easement will be required.

Curb radii at intersections shall have a minimum radius of thirty (30) feet along arterials, twenty-five (25) feet along' collectors and twenty (20) feet along residential streets.

In any case where streets intersect at an angle of other than ninety (90) degrees, the City shall review and comment regarding non-standard right-of-way corner clips and curb return radii.

2.9 Relation to Adjoining Streets:

The system of streets designed for the development, except in approved cases, must connect with streets already dedicated in adjacent developments. Where no adjacent connections are platted, the streets must be the reasonable projection of streets in the nearest subdivided tracts and must be continued to the boundaries of the tract development, so that other developments may eventually connect with the proposed development.

At the intersection of a new subdivision street with an existing boulevard arterial, the Developer of the subdivision shall construct a median opening in the boulevard, unless otherwise directed by the City in writing.

Strips of land controlling access to or egress from other property or any street or alley or having the effect of restricting or damaging the adjoining property for development or subdivision purposes or which will not be taxable or accessible for special improvements shall not be permitted in any development unless such reserve strips are conveyed to the City on fee simple. The City Planning Director or the City's Engineer makes this determination. When such access is needed to maintain permanent City owned utilities, the roadway will be an improved right-of-way. If the utilities are temporary, an improved easement may be approved.

2.10 Dead End Streets, Cul-de-Sacs and Courts:

Cul-de-sacs are permitted and encouraged within residential subdivisions. Use of this design shall provide proper access to all lots and shall not exceed six hundred (600) feet in length, measured from the center of the cul-de-sac to the center of the intersecting street (not a dead end street). Specific aspects of the standard cul-de-sac design are given in Figure 2.1B. In lieu of the typical design shown, the City may approve alternative concepts for a specific application.

2.11 Street Grades:

Arterial streets may have a maximum grade of seven and one-half (7½) percent, for a maximum continuous distance of two hundred (200) feet. Collector streets may have a maximum grade of seven and one-half (7½) percent. 'Residential streets may have a maximum grade of ten (10) percent, unless otherwise approved by the City, where the natural topography is such as to require steeper grades. All streets must have a minimum grade of at least five-tenths (0.5) of one (1) percent. Centerline grade

changes with an algebraic difference of more than one (1) percent shall be connected with vertical curves in compliance with the minimum length requirements set forth in Table 2.2.

2.12 Pavement Design:

Pavement and pavement subgrades (Roadway and Firelanes) shall be designed based on representative onsite soil sub-surface conditions. Pavement design calculations shall be prepared by Professional Engineer licensed in the State of Texas, and be submitted with the preliminary construction plans for review as part of the construction plan review process. The submittal shall include the pavement design traffic loadings and design life.

Pavement and subgrade shall be as follows:

A. Residential Pavement: Reinforced concrete pavement thickness shall be determined by pavement design calculations. Minimum thickness of reinforced concrete pavement shall be no less than six (6) inches reinforced with No. 3 bars at 18-inch centers both ways. Concrete strength shall be NCTCOG Item 303.3.4.2. Class C (3,600 psi Compressive Strength in 28-days), with a cement content of not less than 6 sacks per cubic yard. Subgrade preparation and thickness shall be based on pavement design calculations and shall be lime stabilized no less than six (6) inches in depth. All curbs shall be 6" monolithic barrier curbs.

B. Arterial, Minor Collector, Major Collector, and Firelane Pavement: Reinforced concrete pavement thickness shall be determined by pavement design calculations. Minimum thickness of reinforced concrete pavement shall be no less than eight (8) inches reinforced with No. 3 bars at 18-inch centers both ways. Concrete strength shall be NCTCOG Item 303.3.4.2. Class C (3,600 psi Compressive Strength in 28-days), with a cement content of not less than 6 sacks per cubic yard. Subgrade preparation and thickness shall be based on pavement design calculations and shall be lime stabilized no less than six (6) inches in depth.

C. Subgrade: Subgrade design shall be based on representative onsite subsurface soil conditions and testing. Testing shall be in accordance with the NCTCOG Standard Specifications for Public Works Construction and be completed by a geotechnical testing lab. The geotechnical investigation shall be submitted to the City as part of the pavement design submittal. In general, the soils testing shall include representative soil borings of the site and the testing of Atterburg limits. Based on the testing results, the pavement design shall provide the percentage of the subgrade lime stabilization proposed. Stabilization shall span the width of the street, back-of-curb to back-of-curb, plus twelve (12) inches beyond the back of curb on each side, and be a minimum of six (6) inches in depth, unless greater extents recommended by the geotechnical investigation. Subgrades shall be mechanically compacted to ninety-five (95) percent standard proctor densities at optimum moisture.

Future driveway cuts on existing streets shall have proposed driveway pavement constructed within 48-hours of driveway excavation or a temporary concrete mud mat shall be constructed to protect the existing street subgrade from excessive moisture penetration or moisture evaporation.

TABLE 2.2

CREST VERTICAL CURVES

Design Speed (MPH)	Coeff. of Friction (a)	Stopping Sight Dist. (Ft.)	Stopping Sight Dist. Rounded for Design (Ft.)	K	K Rounded for Design
15	0.42	72.98	75	4.01	5
20	0.40	106.83	125	8.59	10
25	0.38	146.70	150	16.19	20
30	0.36	193.58	200	28.20	30
35	0.34	248.72	250	46.55	50
40	0.32	313.67	325	74.03	80
45	0.31	383.12	400	110.44	120

(a) AASHTO, p. 316

TABLE 2.2 Cont'd

CREST VERTICAL CURVES

ROUNDED
MINIMUM LENGTH OF VERTICAL CURVE IN FEET
For Speeds and K Values Shown Below
(L - KA)

Algebraic Grade Diff. (%) (A)	MPH K	15 5	20 10	25 20	30 30	35 50	40 80	45 120
1		5	10	20	30	50	80	120
2		10	20	40	60	100	160	240
3		15	30	60	90	150	240	360
4		20	40	80	120	200	320	480
5		25	50	100	150	250	400	600
6		30	60	120	180	300	480	720
7		35	70	140	210	350	560	840
8		40	80	160	240	400	640	960
9		45	90	180	270	450	720	1080
10		50	100	200	300	500	800	1200
11		55	110	220	330	550	880	1320
12		60	120	240	360	600	960	1440
13		65	130	260	390	650	1040	1560
14		70	140	280	420	700	1120	1680
15		75	150	300	450	750	1200	1800

TABLE 2.2 Cont'd

SAG VERTICAL CURVES

Design Speed (MPH)	Coeff. of Friction (a)	Stopping Sight Dist. (Ft.)	Stopping Sight Dist. Rounded for Design (Ft.)	K	K Rounded for Design
15	0.42	72.98	75	8.13	10
20	0.40	106.83	125	14.75	20
25	0.38	146.70	150	23.56	30
30	0.36	193.58	200	34.78	40
35	0.34	248.72	250	48.69	50
40	0.32	313.67	325	65.69	70
45	0.31	383.12	400	84.31	90

(a) AASHTO, p. 316

(b) AASHTO, p. 312

TABLE 2.2 Cont'd

SAG VERTICAL CURVES

ROUNDED
MINIMUM LENGTH OF VERTICAL CURVE IN FEET
For Speeds and K Values Shown Below
(L - KA)

Algebraic Grade Diff. (%) (A)	MPH K	15 10	20 20	25 30	30 40	35 50	40 70	45 90
1		10	20	30	40	50	70	90
2		20	40	60	80	100	140	180
3		30	60	90	120	150	210	270
4		40	80	120	160	200	280	360
5		50	100	150	200	250	350	450
6		60	120	180	240	300	420	540
7		70	140	210	280	350	490	630
8		80	160	240	320	400	560	720
9		90	180	270	360	450	630	810
10		100	200	300	400	500	700	900
11		110	220	330	440	550	770	990
12		120	240	360	480	600	840	1080
13		130	260	390	520	650	910	1170
14		140	280	420	560	700	980	1260
15		150	300	450	600	750	1050	1350

2.13 Parkways, Grades and Sidewalks:

All parkways shall be constructed to conform to top of curb grades with a standard transverse slope of one-quarter (¼) inch per foot rise from top of curb to right-of-way.

Where the natural topography is such as to require steeper grades, transverse slopes (except for sidewalk) up to three-quarter (¾) inch per foot may be used with approval of the City.

Sidewalks shall be provided for all residential streets in subdivisions zoned for one or two family dwellings and on all streets designated on the adopted Master Thoroughfare Plan. Barrier free ramps and sidewalks along screening walls, landscaped areas, trails or in parks, shall be installed by the Developer with street construction and the sidewalks in front of residential lots shall be installed by the home builder. The City may require sidewalks in other locations. Where provided, there shall not be less than four (4) feet in width with the inside edge of the sidewalk to be placed one (1) foot off the property line and located wholly within the dedicated street right-of-way, sidewalk corner easement or road easement in the case of private streets. This requirement may be waived by the City Council.

Sidewalks placed adjacent to the back of the curb must be six (6) feet wide and approved by the City's Engineer.

Sidewalks shall be of concrete having a minimum of 3000-psi compressive strength in 28 days. The concrete thickness shall be four (4) inches reinforced with No. 3 bars at 18-inch centers both ways. A minimum of 1½ inches of sand must be placed under sidewalk. Subgrade (including sand) shall be mechanically compacted to 95% density.

2.14 Driveways:

Residential: Residential driveways to serve two car garages shall be not less than sixteen (16) feet nor more than twenty-four (24) feet in width at the property line. The width of the driveway will be larger at the garage for a three car (width to be twenty-eight (28) feet). Shared driveways and garages larger than three cars shall be a case by case basis. Residential driveways shall be separated from one another by a distance of at least ten (10) feet. The radii of all residential driveway returns shall be a minimum of five (5) 'feet and shall not extend past the adjoining property line. The driveway approaches devoted to one use shall not occupy more then sixty percent (60%) of the frontage abutting the roadway or alley.

Multi-Family and Non-Residential: Driveways providing access to multi-family or non-residential uses shall generally have widths between twenty four (24) and forty five (45) feet when measured at their narrowest point near, or at, the property line. The minimum radius for these uses shall be twenty (20) feet. Larger radii are encouraged. Limitations on permissible locations for these driveways are addressed in Section 2.6, Driveway Locations. Driveway radii returns shall not extend across abutting property lines.

2.15 Traffic Information and Control Devices:

The developer shall arrange for the installation of all pavement striping, regulatory, warning and guide signs, including posts, as shown on the approved plans. Street name signs shall be installed at each intersection. Examples of regulatory, warning, information and guide signs are as follows:

A. Regulatory signs shall include, but are not limited to, STOP, 4-WAY, YIELD, KEEP RIGHT and speed limit signs.

B. Warning signs shall include, but are not limited to, DEAD END, NO OUTLET, DIVIDED ROAD and PAVEMENT ENDS.

C. Guide signals shall include, but are not limited to, street name signs, DETOUR, direction arrow and advance arrow.

D. Traffic striping shall be provided by the developer as shown on the approved plans.

The street signs shall be extruded and engineering grade. Sign posts shall be galvanized steel and set in concrete. The developer shall be responsible for the expenses incurred by the City for manufacture and installation of these signs.

House street numbers shall be placed on the curbs for each lot and on the side of the house facing the street frontage.

2.16 Street Lighting:

All developments shall be provided with streetlights. In, general, lights should be located at street intersections and at intervals no greater than four hundred (400) feet apart. Streetlights should be the equivalent of 175-watt mercury vapor fixtures on minor residential streets. All collector and arterial, or commercial streets shall have sodium vapor fixtures with a minimum wattage of 250 or 400 watts as directed, in writing, by the City. In some instances, the City may require greater wattage.

2.17 Barrier Free Ramps:

Barrier free ramps shall be provided in all commercial areas and in residential areas which have sidewalks. Ramps shall be located to provide access in accordance with the standards set by the Americans with Disabilities Act (A.D.A.) at all pedestrian sidewalks and meet all Texas Accessibility Standards (TAS). Lay down curbs and ramps shall be constructed at all street intersections and driveways whether or not sidewalks are being installed. Lay down curbs and ramps shall be constructed by the developer. The developer shall be responsible for paying for and arranging for all TAS design reviews and post construction inspections. Results of TAS inspections shall be provided to the City.

2.18 Off-Street Parking:

A. All parking areas and spaces shall be designed and constructed in accordance with the following requirements:

1. All parking areas and spaces shall be designed and constructed so as to have free ingress and egress at all times.

2. No parking space or parking area shall be designed so as to require a vehicle to back into a public street or across a public sidewalk, except in the downtown overlay district, as defined by the City.

3. Minimum Dimensions for Off-Street Parking:

a) Ninety-degree parking ('Figures 2.4a and 2.4b) — Each parking space shall not be less than nine (9) feet in width and eighteen (18) feet in length with two (2) feet of over hang between curb and sidewalk or property line (20 foot minimum). Dual head in parking spaces should be a minimum of twenty (20) feet in length; Aisle width shall not be less than twenty-four (24) feet.

b) Sixty-degree angle parking (Figures 2.5a and 2.5b) — Each parking space shall be not less than nine (9) feet wide perpendicular to the parking angle nor less than twenty and one tenth (20.1) feet in length when measured at right angles to the building or parking line. Maneuvering space shall be not less than fourteen and one-half (14½) feet for one way traffic or twenty two (22) feet for two way traffic perpendicular to the building or parking line.

c) Forty-five degree angle parking (Figures 2.6a and 2.6b) — Each parking space shall not be less than nine (9) feet wide perpendicular to the parking angle nor less than nineteen (19) feet in length when measured at right angles to the building or parking line. Maneuvering space shall be not less than twelve (12) feet for one way traffic or twenty-one (21) feet for two-way traffic perpendicular to the building or parking line.

d) Parallel Parking — Each parking space shall not be less than nine (9) feet in width and twenty-two (22) feet in length. Maneuvering space will not be less than twenty (20) feet.

e) Handicap Space Parking — Handicap parking spaces are required to meet ADA and TAS regulations.

f) When off-street parking facilities are located adjacent to a public alley, the width of said alley may be utilized as a portion of the maneuvering space requirement, provided the alley is paved.

g) When off-street parking facilities are provided' in excess of minimum amounts herein specified, or when off-street parking facilities are provided, but not required by this chapter, said off-street parking facilities

shall comply with the minimum requirements for parking and maneuvering space herein specified.

4. Paving Standards:

   a) Unless otherwise approved by the City Council or as specified in these standards, all parking lots shall be paved with concrete or asphalt, and designed according to City standards and specifications. The parking lanes must be clearly marked by approved paint, buttons or other material. All driveway approaches shall be constructed of concrete in the same strength as the adjacent street and shall be curbed per City standards.

   b) The pavement within a designated loading area shall be designed and constructed to carry the additional loading of merchandise, goods, sanitation pick-up, etc., in order to prevent any unnecessary failure in the pavement itself. The pavement design shall be included in the engineering construction plans and specifications and submitted to the City's Engineer for review.

   c) Fire lane pavement shall be a minimum of six (6) inches with lime stabilized subgrade. Concrete strength shall be NCTCOG Item 303.3.4.2. Class C (3,600 psi in 28-days). Asphalt firelanes are not permissible, unless approved by the City.

5. All entrances or exits in a parking lot shall be a minimum of thirty (30) feet from the beginning point of any corner radius.

6. All entrances or exits in a parking lot shall be a minimum of twenty-four (24) feet and a maximum of forty-five (45) feet in width, unless One-way, in which case they shall both be a minimum of twelve (12) feet, or as approved by the City Council.

7. The driveway approach angle to any parking area shall be a maximum of sixteen (16) degrees; the departure angle a maximum often (10) degrees; the ramp angle a maximum of eleven (11) degrees; or otherwise shall be approved by the City's Engineer.

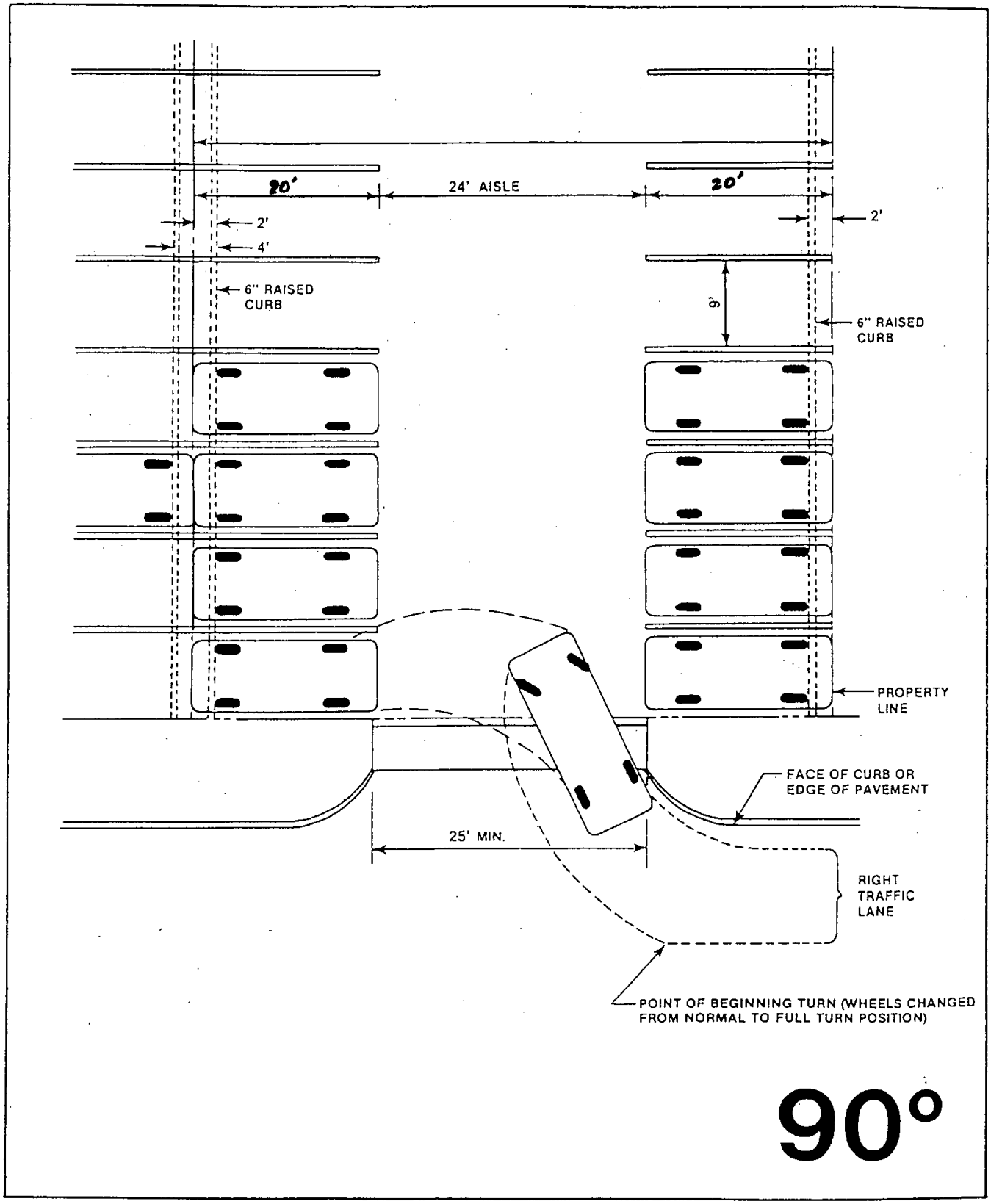
8. No parking areas or parking spaces shall be allowed to pave over or utilize public right-of-way, with the exception of approved entrances and exits, unless the City Council approves a site plan provided be the developer.

9. Any lighting used to illuminate any off-street parking area shall be so designed and constructed as to direct the light onto the property and away from any adjoining property or~~,~~ street.

10. All multi-family and commercial parking areas and parking spaces shall be designed and constructed to protect adjacent residences from the direct glare of headlights of vehicles using the parking area.

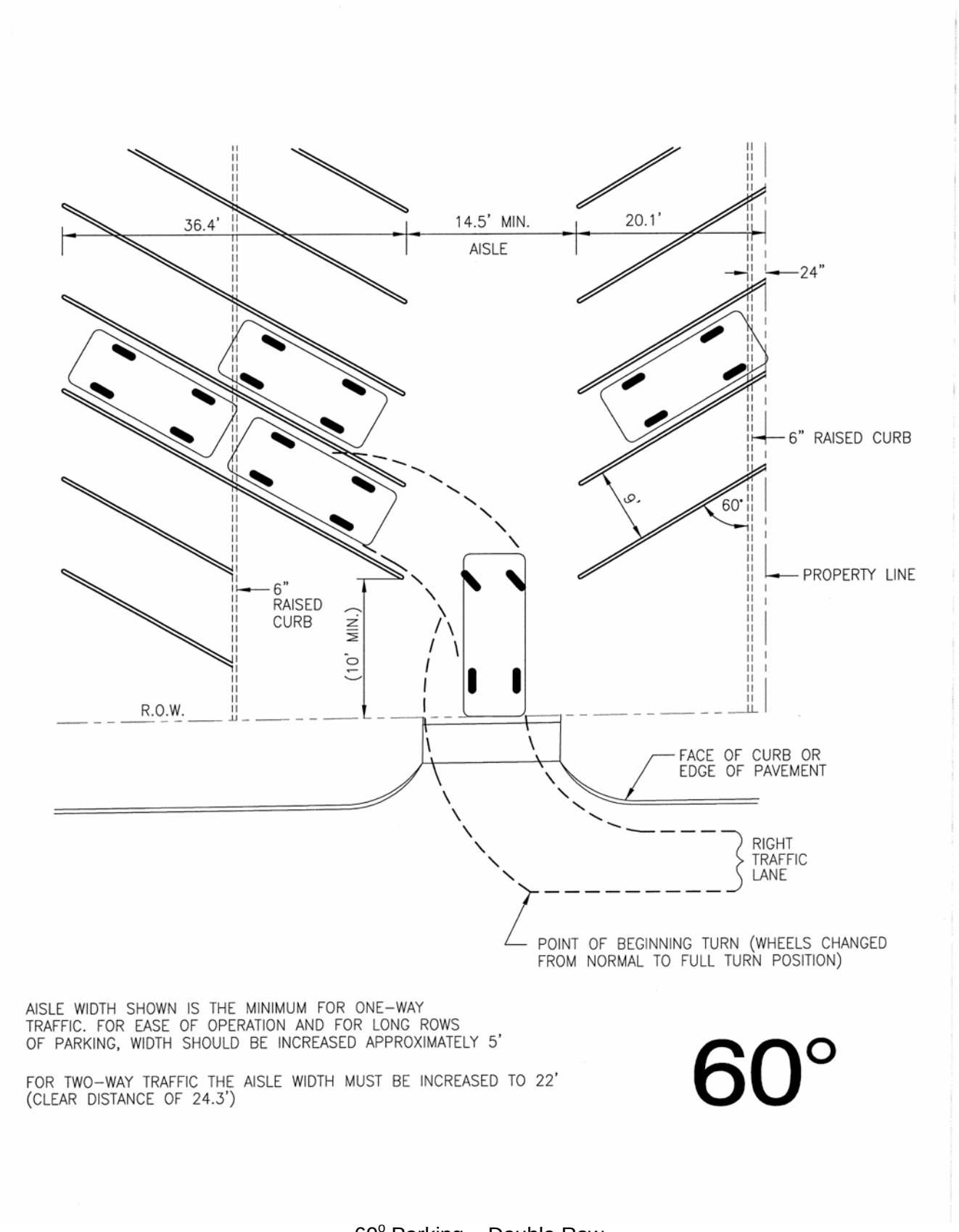
11. All multi-family, retail, commercial and industrial parking lots shall be required to provide a fire lane with a minimum width of twenty-four (24) feet (requires minimum thirty (30) foot inside curve radius).

12. No City street curb, alley or street pavement may be cut without a permit from the City.



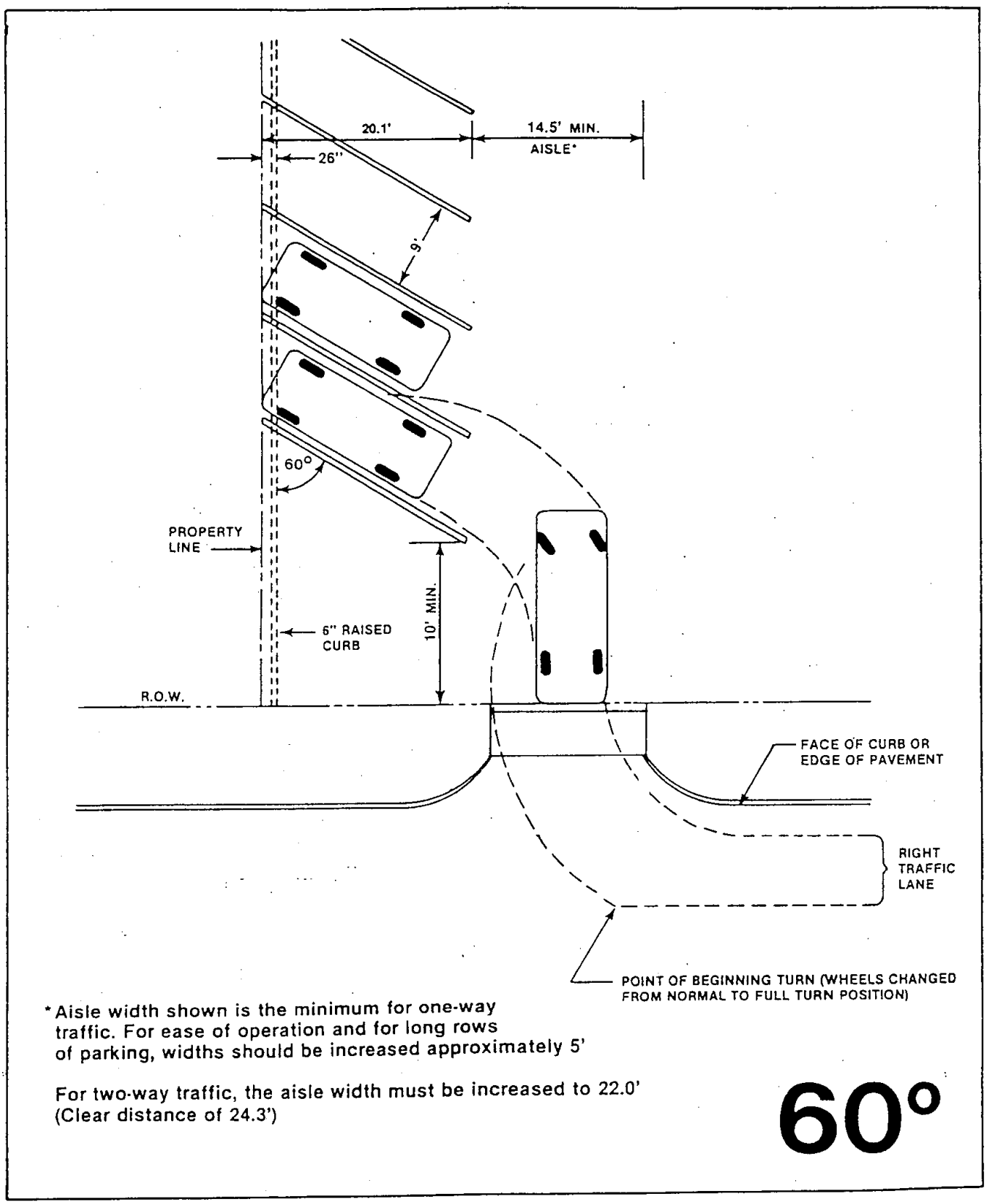
90° Parking – Double Row.

FIGURE 2.4a



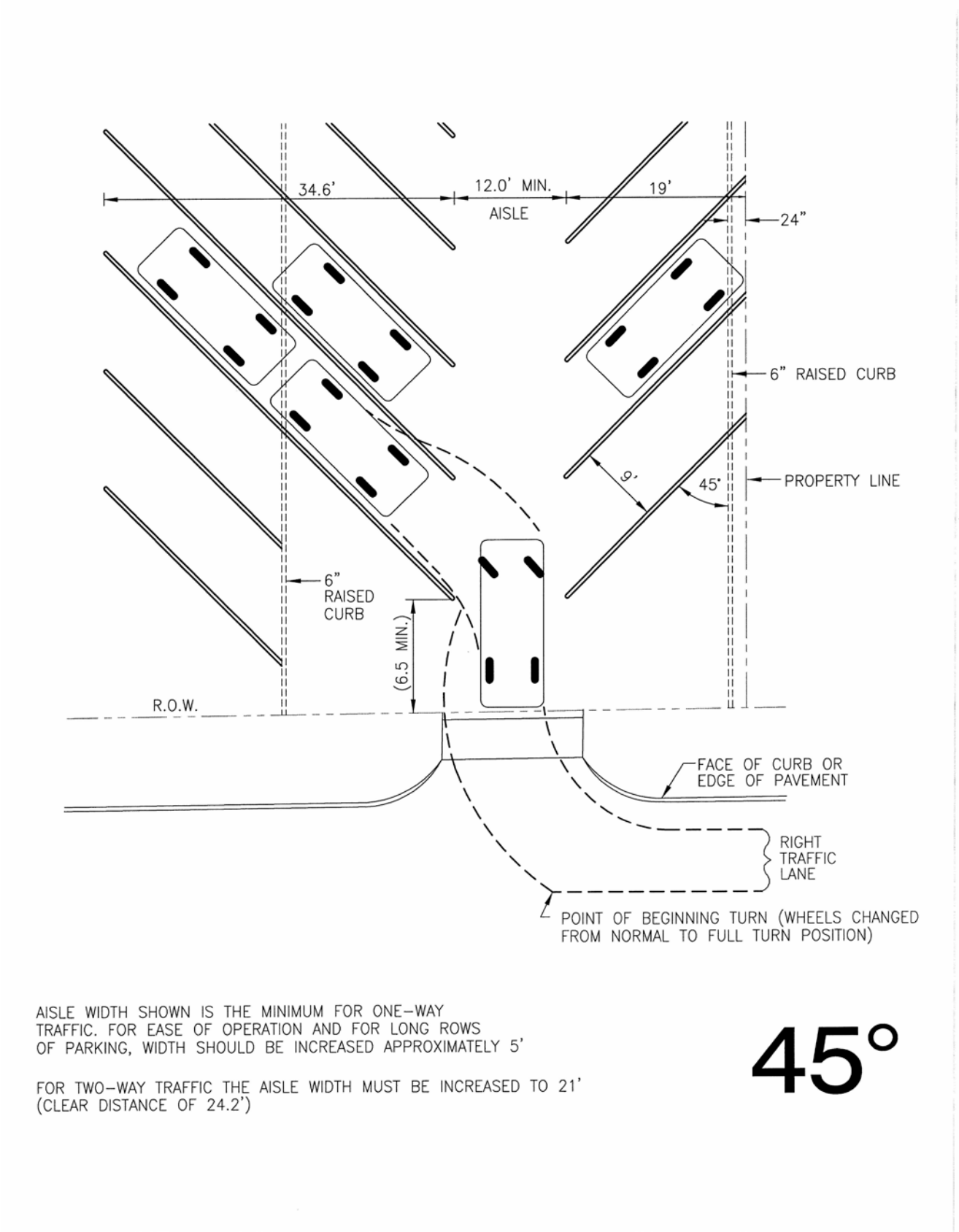
60° Parking – Double Row.

FIGURE 2.5a



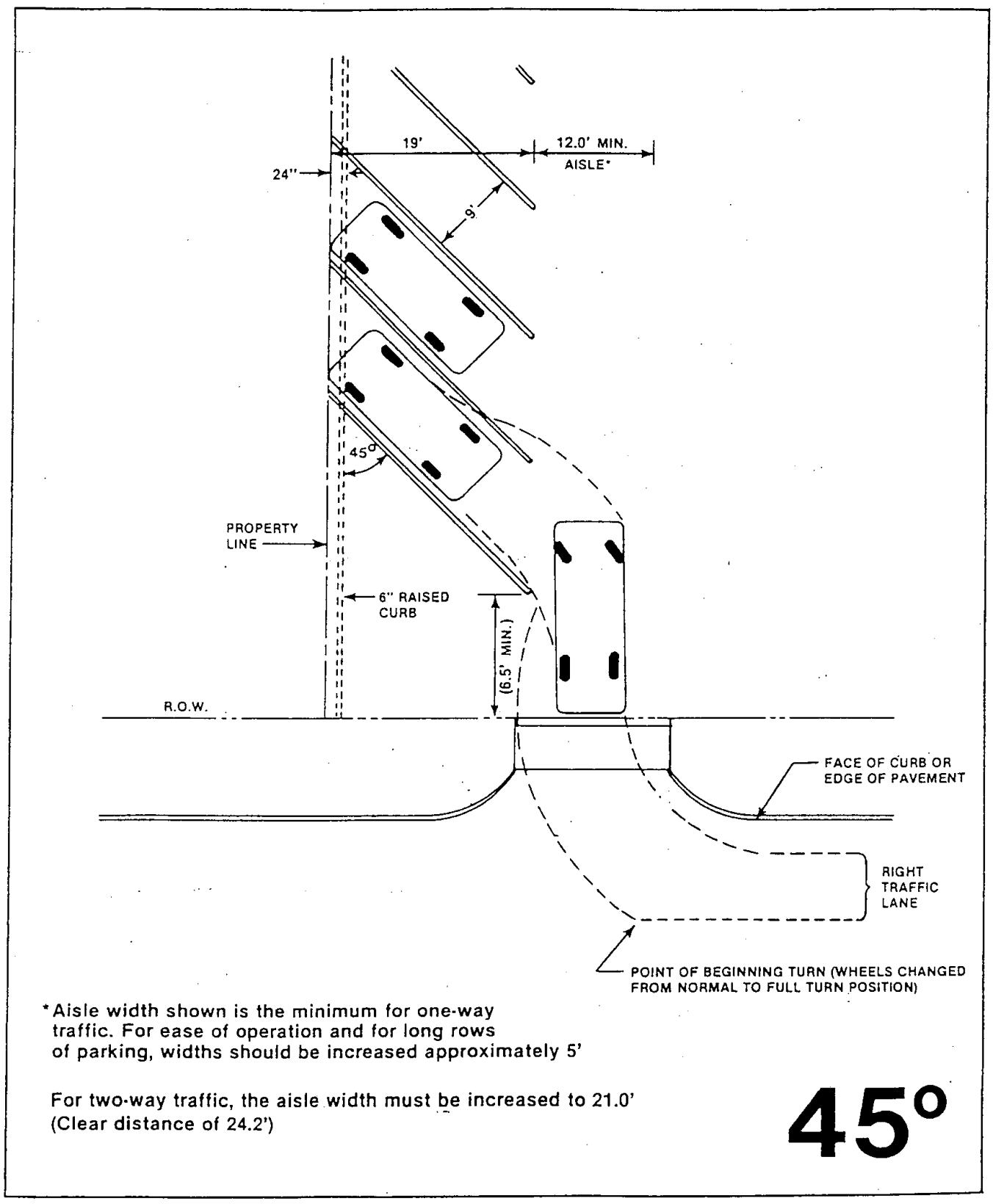
60° Parking – Single Row.

FIGURE 2.5b



45° Parking – Double Row.

FIGURE 2.6a



45° Parking – Single Row.

FIGURE 2.6b

Section 3. STORM DRAINAGE FACILITIES

3.1 Introduction:

Drainage facilities shall be designed and constructed at such locations and of such size and dimensions to adequately serve the development and the contributing drainage area above the development, as well as the affected areas downstream. The developer shall provide all the necessary easements and rights-of way required for drainage structures including storm drains and open channels, lined or unlined. Easement widths for storm drain pipelines shall not be less than fifteen (15) feet, and easement widths for open channels shall be at least fifteen (15) feet wider than the top width of the channel. In all cases, easements shall be of an adequate size to allow proper maintenance.

The design, size, type and location of all storm drainage facilities shall be subject to the review of the City's Engineer and acceptance by the City. The requirements set forth herein are considered minimum requirements. The developer and the developer's engineer shall bear the total responsibility for the adequacy of design. The review by the City's Engineer and/or acceptance of the facilities by the City in no way relieves the developer of this responsibility.

Storm drainage released from the site will be discharged to a natural water course or storm sewer system of an adequate size to convey the 100-year storm runoff expected after development..

3.2 Storm Drainage Design Criteria:

A. General: The City of Plano's current Storm Drainage Design Manual shall be used for storm drainage calculations. Drainage area calculations, storm pipe calculations, and inlet capacity calculations are required with engineering plan submittals, at a minimum. Additional information may be required by the City.

B. Storm Pipe Size: The minimum size storm sewer line shall be eighteen (18) inches.

C. 100-Year Flood Zones: Where the Federal Emergency Administration (FEMA) has defined a flood hazard area with regard to a drainage course, the flood hazard zone and the floodplain and floodway, if available, shall be shown on the plat and drainage area map. Any development proposed within a floodplain shall complete a flood study to determine that the proposed development meets the City's current floodplain management ordinance and will not be detrimental to any other property.

D. Local 100-Year Flood Zones: 100-year flood zones shall be determined for non-FEMA creeks or streams (flowing or not) within a subdivision.

E. Access: Storm drainage facilities shall include all elements of a drainage system consisting of streets, alleys, storm drains, channels, culverts, bridges, swales and

any other facility through which or over which storm water flows, all of which the City must have a right in, either in the form of a dedicated right-of-way, floodway or drainage easements.

F. Storm Drainage Management Plan: All new subdivisions shall provide as part of the subdivision review process a complete storm drainage management plan. This plan will include, but not be limited to, the following: a complete review of all on-site, upstream and downstream drainage within the impacted watershed; determine all on-site and downstream drainage facility improvements due to the increased runoff from the proposed development and future upstream and downstream developments; and shall contain calculations necessary to determine compliance with the Standards of Design herein. The plan shall be done, using current zoning conditions or land use prescribed by the City's Land Use Plan (whichever creates the greatest storm water runoff), with maximum development considered throughout the watershed. The storm drainage plan shall show all necessary improvements with flow data provided at each point of interception of water. As part of the storm drainage plan, the developer shall show a lot grading plan to direct all water to proper intersection points avoiding cross flow of water from lot to lot. All upstream discharge shall be intercepted and carried through the proper intersection points avoiding cross flow of water from lot to lot. All upstream discharge shall be intercepted and carried through the proposed development in compliance with the Standards of Design herein. All discharge from the proposed development shall be designed in accordance with the Standards of Design herein with all necessary improvements being installed by the developer to protect downstream property from damage. The determination of necessary improvements to existing drainage facilities downstream of a proposed development shall be reviewed by the City's Engineer for compliance and adequacy.

G. Storm Water Pollution Prevention Plan: The developer shall provide a Storm Water Pollution Prevention Plan (SWPPP), in compliance with all TCEQ and NPDES regulations, for each project. A copy of the SWPPP and Notice of Intent (NOI) shall be on file at the City prior to the issuance of a building permit.

H. Exemptions: At the City's discretion, alternative storm sewer design criteria and calculations may be considered for special or unique development cases. The alternative design criteria to be considered by the City, on a case-by-case basis, and storm drainage design criteria shall be approved by City Council.

Section 4. VEGETATION

4.1 General:

All seeding, sodding and fertilizer requirements are to be completed in accordance with the North Central Texas Council of Governments (NCTCOG) Standards and Specifications and as modified by the City of Anna, herein.

Block sod may be utilized for erosion control. Block sod shall be growing grass sod of the type specified in the plans. Sod shall have a healthy and dense root system, be

stored and maintained in a moist condition from the time of harvest until planted and be free from noxious weeds.

Seed shall be from previous season's crop meeting the Texas Seed Law, including testing and labeling for pure live seed (PLS = Purity x Germination). Furnish seed of designated species, in labeled unopened bags or containers for inspection by the City's Public Works Department. Seed shall be used within 12-months from the date of the season harvested. When Buffalo grass is utilized, use seed that is treated with Potassium Nitrate to overcome dormancy.

4.2 Coverage:

The developer shall establish grass and maintain the sodded or seeded area, including watering, until a "Stand of Grass" is obtained. A "Stand of Grass" shall consist of 75% to 80% coverage and a minimum of one-inch (1") in height. If a "Stand of Grass" has not been established within four weeks, re-sodding or re-seeding shall be required. Re-grading, Re-sodding and re-seeding will be required in all washed areas and areas that do not grow.

4.3 Planting Season for Seeding:

- February 1 through May 15 **(Permanent Rural** Seed Mix)
  Green Spangletop – 0.3 LB. PLS/Ac.
  Bermuda Grass – 1.2 LB. PLS/Ac.
  Sideoats Grama (El Reno) 2.7 LB. PLS/Ac.
  Little Bluestem (Native) 2.0 LB. PLS/Ac.
  Buffalogras (Texoka) 1.6 LB. PLS/Ac.
  Illinois Bundleflower 1.0 LB. PLS/Ac.

- February 1 through May 15 (**Permanent Urban** Seed Mix)
  Green Spangletop – 0.3 LB. PLS/Ac.
  Bermuda Grass – 2.4 LB. PLS/Ac.
  Sideoats Grama (El Reno) 3.6 LB. PLS/Ac.
  Buffalogras (Texoka) 1.6 LB. PLS/Ac.

- September 1 through November 30 (**Temporary Cool** Season Seeding)
  Tall Fescue – 4.5 LB./Ac.
  Western Wheatgrass – 5.6 LB./Ac.
  Wheat 34 LB./Ac.

- May 1 through August 31 (**Temporary Warm** Season Seeding)
  Foxtail Millet – 34 LB./Ac.

A mix of seed shall be used in overlapping planting seasons.

No Seeding shall occur during the months of December and January.

Section 5. WATER SYSTEM

5.1 General:

The design and construction of the water distribution system to serve the development shall be in accordance with good engineering principles, with these Design Standards and with the requirements of the Texas Commission on Environmental Quality (TCEQ). All off-site water mains shall be sized and located to conform to projected demands in accordance with the latest Water Master Plan and the computer model with regard to the impact of each development on the existing and proposed water distribution system. No construction shall commence prior to the approval of the plans and specifications by the City.

All facilities shall be of sufficient size to provide adequate capacity for ultimate development. The pipelines shall be sized to meet the maximum instant domestic requirements plus an appropriate allowance for fire protection water. The design criteria for water demand shall be submitted to the City with the plans and specifications. The City reserves the right to require larger pipelines than required for the proposed development in order to provide capacities for areas outside the development. The developer will be responsible to construct water lines adjacent to their property in accordance with the latest Water Master Plan, across the frontage of the tract, or as required by the City. All facilities that are to be public shall be constructed with domestically manufactured materials.

The minimum pipeline size to serve residential areas shall be eight (8) inches in diameter, and the minimum pipeline size serving commercial, business, industrial, etc. shall be eight (8) inches. In general, all lines shall be looped with no dead-ends. Dead-end lines will be considered on a case by case basis and shall be furnished with an approved flush valve arrangement. The developer shall provide facilities sufficient for fire flows in accordance with the minimum criteria of the State Board of Insurance or the Fire Code adopted by the City.

Fire flows to be calculated with a minimum of thirty five pounds per square inch (35 psi) of residual pressure at the fire hydrant with a 35 psi residual in the water distribution system.

5.2 Connections to Existing Distribution System:

Preliminary discussions concerning take-off points in the distribution system should be conducted with the City of Anna Public Works Department prior to finalizing the preliminary designs of the distribution system, which will serve the development. Connections to the City's existing system will be allowed only at locations where the City has determined that sufficient quantity and pressures are available to meet the projected requirements of the development. In general, the connections to the existing distribution system shall be made in such a manner to keep "shut-downs" to a minimum. Preference will be given to a tapping sleeve and valve connections.

In a proposed development where City water is not adjacent to the property but is accessible, the developer shall provide, at his expense, an off-site water main of

sufficient size to serve his development or as shown on the City's Water Master Plan, whichever is larger. The proposed development will normally require a loop into the existing water distribution system in order to provide adequate water pressure. The loop will be at the developer's expense.

In general, the City will not approve a development which cannot be served by extensions to the City distribution system. Some areas in the City may be served by private water companies. In those cases, the Developer shall contact and make proper arrangements with the private water company. The Developer shall always be responsible to construct water facilities that meet City requirements and as shown on the City's Water Master Plan. The City will observe the facilities during construction for compliance with these standards. This in no way relieves or reduces the obligations of the developer to comply fully with these requirements. Under certain circumstances, the City may consider approval of a private water system, which will supply an adequate quantity of potable water for all uses, including residential, commercial and fire fighting requirements. Such systems must meet the approval of the City, the TCEQ, the State Board of Insurance, and all other appropriate regulatory agencies. In addition, an agreement between the City and the developer shall be executed whereby the City may acquire the system when it can be connected into the City's owned and operated distribution network. In all cases, the engineering drawings shall show the source of water for the development.

5.3 Location of Facilities:

A. Pipelines: Water pipelines shall be located in the parkways between the back of the curb and the street right-of-way. The location shall be two feet (2') from the back of curb. Water lines installed adjacent to a development shall be installed the length of the frontage. A blue Electronic Marking System (EMS) Locator Pad will be located as shown in the Standard Drawings.

B. Gate Valves: Gate valves shall be located outside the paved streets and shall be two feet (2') from back of curb of the intersecting street. In general, gate valves shall be located at street intersections (except for fire hydrant leads). Maximum spacing of valves on water lines is 1,000'. All valve boxes shall be encased in a concrete pad that shall be twelve inches by twelve inches by six inches (12" x 12" x 6") and reinforced with No. 3 steel bars.

C. Fire Hydrants: In general, fire hydrants shall be located at each street intersection and at intervals on the interior of each block. All fire hydrants shall have isolation valves constructed as described above. No services lines or other connections will be allowed to the fire hydrant leads.

1. Residential and Duplex: Residential and duplex areas shall have a fire hydrant at each street intersection and at five hundred foot (500') intervals on the interior of each block. In no case, shall there be more than four hundred feet (400') of hose lay from a fire hydrant and fire lane to any main building.

2. Multi-Family: Multi-Family areas shall have a fire hydrant at each street intersection and at three hundred foot (300') intervals on the interior of each block and along fire lanes. In no case, shall there be more than one hundred

and fifty feet (150') of hose lay from a fire lane or two hundred and fifty feet (250') from a fire hydrant to any portion of a building.

3. Commercial, Retail and Industrial: Commercial, retail and industrial areas shall have a fire hydrant at each street intersection and at a maximum of three hundred foot (300') intervals on the interior of each block and along fire lanes. In no case, shall there be more than one hundred and fifty feet (150') from a fire hydrant and fire lane to any portion of a building in any development.

All fire hydrants, which are placed in off street rights-of-way, shall have a paved concrete access road and proper pavement markings, which have been accepted by the Fire Marshall and City's Engineer.

All fire hydrants shall be marked in the center of the adjacent street with a Blue Stimsonite (or approved equal) Model 88-SSA Fire Hydrant Marker

The spacing of fire hydrants shall be measured along the street frontage or fire lanes. The City Fire Marshall and City's Engineer shall review all fire hydrant spacing. When a special condition exists due to land use, the Fire Marshall or City's Engineer may require additional hydrants for fire protection.

5.4 Water Service Connections:

A water service pipeline shall be laid to each lot with fittings and a meter box in accordance with the Standard Details. All service pipelines, which supply water to each single-family lot, shall be constructed of SDR-9 (Polytube) having a minimum size of Three-fourths inch (3/4").

All water services under pavement shall be encased in a minimum 2" diameter SDR 21 PVC encasement pipe or approved equivalent, with no couplings being installed under the roadway. The ends of the encasement pipe shall be sealed with silicone.

All residential services shall be tapped to the PVC water main using double strap brass saddle. Tapping tees are required for all services larger than 4-inches.

Meter box tops shall be set one-half inch to one and one-half inch (½" to 1½") above the curb, and an angle meter stop shall be set six inches (6") below the meter box top. Meter boxes shall have a one-inch (1") wide slot from five inches (5") below the top of the box to the bottom of the box on the side facing the lot for service connection. All meter boxes shall be set at least two feet (2') behind the curb, with a "W" etched into the curb adjacent to the meter box.

A. Installation of Meter Boxes: Installation of meter boxes with, with reader window within the lid, for single-family, multi-family, condominium, and townhouse developments may be installed only at approved locations. Each single-family and duplex residence shall have individual meters taps and boxes. Condominium, townhouse, or multi-family developments may use alternate installations, approved on a case-by-case basis.

Service pipeline size for commercial and industrial developments shall be designed by the developer in accordance with the City's adopted Uniform Plumbing Code.

5.5 Materials and Installation:

A. Pipe: Water pipelines shall be PVC pipe conforming to the Standard Specifications for Construction. In general, the water pipelines shall be AWWA Standard C-900 with cast-iron outside dimensions, and installed with a minimum of four feet (4') of cover from proposed final grade, unless otherwise approved by the City.

B. All water mains under pavement shall be encased as follows:

   a. 8-inch through 10-inch – encase in SDR 35 PVC or approved equal

   b. 12-inch and larger – encase in steel pipe, size and thickness (1/4" min.) to be approved by the City's Engineer.

C. All pipes not under pavement shall be installed in embedment material as shown on the Standard Details.

D. All water pipe shall be installed with a "tracer tape" blue in color over the top of the pipe. The tape shall be Terra Tape "D" Detectable as supplied by Griffolyn Co., Inc. of Houston, Texas or approved equal. Locator marker pads shall be installed at 250 feet along water lines.

E. Gate Valves: All gate valves shall be conform to AWWA C-509 standards manufactured by Mueller, Clow, or an approved equal with resilient seat only and shall conform to and shall be installed according to the Design Standards and Specifications Manual.

F. Fire Hydrants: Fire hydrants shall be either Mueller, Clow, or an approved equal conforming, to the requirements set forth in the Design Standards and Specifications Manual. All fire hydrants shall be installed with a six-inch (6") gate valve on the hydrant lead and located 3-feet off the back of curb. Fire hydrants shall be painted red. Fire hydrants, or an approved flush valve arrangement, shall be installed at the end of each dead end line. Minimum main size for a fire hydrant for residential and non-residential uses shall be eight inches (8").

   Fire hydrants shall be three way breakaway type and conform to AWWA C-502 specifications.

   Fire hydrants shall be painted with two coats of TNEMEC Series 530 Omnithane paint or approved equal, and two coats of primer. Bonnet to flange and nozzle caps of fire hydrants shall painted with two coats of TNEMEC Safety Paint Series 2H "Hi-Build" in accordance with Table 5.2.

G. Water Service Connections: Service pipelines shall be in accordance with the designs shown on the Standard Drawings. The materials shall be Mueller or approved equal and shall be installed in accordance with the Standard Specifications for Construction. All connections shall be compression type or

approved equal.

H. Bends: Mega-lugs or approved equal shall be installed at horizontal change in directions 45^{o} or greater and at all vertical change in directions that require a bend. The restraints shall be placed at the bend and at the next pipe joint in each direction from the bend.

I. All irrigation meters shall have a testable double check backflow preventer.

J. All iron fittings shall be covered and secured with plastic wrap prior to backfill being placed.

Section 6. WASTEWATER SYSTEM

6.1 General:

The design and construction of the wastewater collection system to serve the development shall be in accordance with good engineering principles, these Design Standards and the requirements of the Texas Commission on Environmental Quality (TCEQ). No construction shall commence prior to the approval of the plans and specifications by the City of Anna. All sewer mains and lift stations shall be sized and located to conform to the projected flows in accordance with the latest Wastewater Master Plan.

All facilities shall be of sufficient size to provide adequate capacity for the ultimate development. The wastewater lines shall be sized to meet the peak-day dry weather flow plus an appropriate allowance for infiltration of storm water. The minimum wastewater pipeline size (other than service lines) for all developments shall be eight (8) inches in diameter. The design criteria and calculations shall be submitted to the City with the plans and specifications. The City reserves the right to require a pipeline of a larger size than that required by the development in order to provide capacities for areas outside of the development.

All wastewater lines shall be installed at a depth sufficient to permit all water pipelines to be above the wastewater when the water pipeline has a minimum cover of four (4) feet. In such cases where water pipelines either cross or otherwise come within nine (9) feet of a wastewater pipeline, the wastewater pipe is required to be PVC pressure pipe with a minimum working pressure class of 150 psi.

6.2 Connections to Existing Wastewater Collection System:

Preliminary discussion concerning entrance points in the collection system shall be conducted with the City of Anna Public Works Department prior to finalizing the preliminary designs of the collection system. In a proposed development where City waste water collection facilities are not adjacent to the property but are accessible, the developer shall provide, at his expense, a wastewater interceptor of sufficient size to serve his development and the contributing service area (using fully developed flows).

In general, the City will not approve a development which cannot be served by extensions to the City's wastewater collection system. Lots with a minimum area of 1 acre may be considered, on a case-by-case basis, for a septic system, and will require City Council approval. Lots with approved septic system shall be designed in the case that the City's wastewater collection system is extended to the lot, the septic system can be readily connected to the City's wastewater collection system.

6.3 Location of Facilities:

A. Wastewater Pipelines: Wastewater pipelines shall be located in the parkways between the back of the curb and the street right-of-way. The location shall be three feet (3') from the back of the curb. A green Electronic Marking System (EMS) Locator Pad is to be installed. No wastewater services can be connected to wastewater mains at depths greater than five feet (5'). Wastewater mains installed adjacent to a development shall be extended the length of the development frontage.

B. Wastewater Service Pipelines: Wastewater service pipelines shall be laid to each lot. The service pipelines shall be PVC pipe having a minimum diameter of four (4) inches and shall extend to the property corner. Wastewater service pipelines shall be located at the center of each lot and as approved on the final construction plans by the City. In general, a service pipeline shall serve one lot. Special wastewater service sizing may be required. No sewer line shall be located nearer than five (5) feet from any tree or structure, nor any closer than ten (10) feet from any water service or main. Sewer services shall be encased under paved surfaces.

All sewer services shall be connected to the main using a wye connection with a 45 degree bend to complete the connection. No tee connections will be allowed.

The service shall be stubbed out a minimum of ten (10) feet from the back of curb and at a depth no greater than five (5) feet. The stub-out shall be capped with a proper fitting and shall have a double sweep cleanout installed within five (5) feet of the lot line and which extends to at least two (2) feet above the finished lot grade. The cleanout stack shall be set to grade during construction of the structure to be served and before a certificate of occupancy will be issued. After the street paving is complete, the letter "S" shall be cut into the concrete curb to locate the service.

C. Manholes: In general, manholes shall be located at all intersections of wastewater pipelines, changes in grade, changes in alignment and at distances not to exceed five hundred (500) feet. For sewer line flowlines connecting eighteen (18) inches or greater above invert, an external drop manhole shall be constructed. Manholes shall be designed for loading conditions, and rims be flush with surface, when placed under pavement. Manhole rims located in a landscaped area shall be six (6) inches above grade. Manholes located in floodplains, or areas with increased risk of flooding, shall have bolt down lids. Manhole size shall be per Table 6.1. Construct manholes at both ends of lines that are installed by other than open cut and at each end of aerial crossing lines. When manholes are installed adjacent or within a roadway, the letters "MH" shall be etched into the curb line.

TABLE 6.1

MINIMUM MANHOLE SIZES

Sanitary Sewer Line Size	Minimum Manhole Diameter
8” and 10”	4.0 feet
12”, 15”, 18”, 21”, 24”, and 27”	5.0 feet
30” 36”, and above	6.0 feet

D. Cleanouts shall be installed at the ends of all lines that do not end with manholes. The maximum distance between a manhole and an upstream cleanout is three-hundred (300) feet. Cleanouts located at the ends of lines located in residential developments will be considered on a case by case basis. Commercial and industrial developments require manholes at the ends of all lines.

6.4 Flows in Wastewaters and Their Appurtenances:

A. Minimum Grades: Wastewater lines should operate with velocities of flow sufficient to prevent excessive deposits of solid materials, otherwise objectionable clogging may result. The controlling velocity with regard to sediment deposition is near the bottom of the conduit and considerably less than the mean velocity flowing full of 2.5 feet per second (fps). TABLE 6.2 indicates the minimum grades for wastewater pipe with a Manning’s “n” = 0.013 and flowing at 2.5 fps.

B. Maximum Velocities: The slope of a wastewater should also be such that excessive velocities will not damage the pipeline. The maximum desirable velocities of wastewaters shall be based upon the pipe manufacturer recommendations not to exceed 10 feet per second (fps).

TABLE 6.2

MINIMUM GRADES FOR WASTEWATER PIPELINES

Pipe Size (Inches)	Slope in Foot/Foot (n = 0.013)
8	0.0033
10	0.0025
12	0.0023
15	0.0023
18	0.0018
21	0.0015
24	0.0013
27	0.0011
30	0.0009
33	0.0008
36	0.0007

39	0.0006
42	0.0006
45	0.0005
48	0.0005
54	0.0004
60	0.0004
66	0.0004
72	0.0003
78	0.0003
84	0.0003
96	0.0002

6.5 Materials and Installation:

A. Pipe: Pipe used for wastewater collection systems shall be PVC pipe conforming to the Design Standard and Specifications and the requirements of the Texas Commission on Environmental Quality (TCEQ). The wastewater pipeline shall conform to ASTM D3034 for sewer pipe and fittings from 4" to 15" in diameter and with ASTM F679, for Sewer pipes and fittings greater than 15" in diameter, and shall have a minimum earth cover of three (3) feet. For depths of ten (10) feet or greater, the wastewater pipeline shall be a minimum pipe stiffness of 115-psi (SDR 26).

All pipes shall be installed in embedment material as shown on the Standard Details. All pipelines shall be tested.

B. Curved Sewers: No vertical or horizontal curves will be allowed.

C. Manholes: Manholes shall be of pre-cast concrete or cast in place and shall conform to Standard Details.

Manholes shall be corrosion protected, with the corrosion protection method approved by the City.

6.6 Testing:

All wastewater lines shall be tested for infiltration in accordance with the procedures set forth in the NCTCOG Standard Specifications for Construction. A television survey shall be performed at the end of the construction period and will again be performed as part of the final testing in the tenth (10^{th}) month of the maintenance period. The television survey shall include having water introduced into the wastewater line during the survey. Deficiencies noted shall be promptly corrected by the developer. All manholes will be hydrostatically or vacuum tested. The City's representative shall be present at all testing and copies of the testing reports shall be provided to the City upon completion. All expenses for this work shall be the developer's responsibility.

6.7 Wastewater Lift Stations and Force Mains:

All lift station design plans and specifications shall be submitted to the City Public Works Department and TCEQ for review and approval prior to construction. Developments which increase the flow to existing lift stations will be subject to a pro-rata charge if sufficient capacity is available in the existing lift station or will be required to increase the capacity of the existing facility. Lift stations and force mains shall be designed and built for the upstream drainage area using a fully developed condition. This will include off-site areas if applicable. Developers are responsible for the construction of regional lift stations and force mains, as required by the Wastewater Master Plan.

Section 7. MISCELLANEOUS REQUIREMENTS

7.1 Grading

A sheep-foot roller shall be utilized for compaction of all fill material.

7.2 Grading Permit

A grading permit (Exhibit 7.1) shall be obtained prior to stockpiling or filling property within the City limits. Care shall be taken to avoid filling in drainage swales, creeks, wetlands, etc. Erosion protection shall be installed around stockpiled or stored material until grass is established. If fill is placed for use other than stockpiling or storage, a grading plan shall be prepared by a Professional Engineer registered in the State of Texas and submitted with the grading permit. Densities shall be taken and proper compaction techniques used when placing the fill. In all cases a Professional Engineer registered in the State of Texas shall certify that the proposed fill location is not within a stream or creek (flowing or not) flood plain. If the City's Engineer determines the fill is to be placed near a creek or stream or possible drainage way, the 100-year floodplain shall be staked by a registered surveyor.

7.3 Private Utility Construction

A. Trench Backfill — City Right-of-Way

1. No concrete streets shall be open cut by utility companies without City approval, by permit. Utilities crossing concrete streets shall be tunneled or bored. Tunneling or boring methods shall be approved by the City prior to installation.

2. Asphalt streets may be open cut, by permit. Backfill above utilities shall be concrete stabilized sand or cement. The asphalt pavement shall be repaired per City detail.

3. All trench backfill is to be mechanically compacted to 95% Standard Proctor Density within City rights-of-way. The compaction may be obtained by

mechanical tamping, rolling, etc. No water jetting is allowed. In the parkway, the backfill material may be from the excavated trench, except no rocks larger than two inches (2") shall be used. Material from rock or shale excavation shall not be used. The contractor for the utility company or the utility company shall furnish density reports from a materials testing company verifying the densities. Densities shall be taken at each twelve-inch (12") lift at a maximum spacing of 150 feet.

B. Parkway Cleanup

The contractor for the utility company or utility company shall remove any rocks or excess trench material from the parkway and replace any disturbed areas with grass sod.

CITY OF ANNA

FILL MATERIAL REQUEST FORM

The following property owner has requested to place fill material at the below noted property location(s). All fill material placed is to be relatively clean and free from debris. The City of Anna is not responsible for any placement, distribution, removal or testing of material that is placed at the below noted location. The City may require that fill material be removed from the site, if discovered that non-suitable material has been placed.

Any fill material placed or dispersed at the designated site shall be graded and compacted so as to not significantly affect or impede any existing drainage flow nor is it to be placed in any area designated as flood plain. An engineered grading plan shall be submitted to the City for review, if deemed necessary by the City Engineer. Methods of placement and compaction of fill material shall comply with City of Anna specifications. Laboratory testing may be required at the discretion of the City Engineer. Placement of material can only occur after a site review has been conducted by a City of Anna Engineering Department representative and approval to place fill has been granted by the City Engineer. Signature of all below noted parties are to be in place prior to fill material placement.

Proper erosion control devices may be required at the discretion of the City of Anna. If required silt fencing and other erosion control devices are to be installed and inspected by the City prior to any fill material placement.

Areas or Locations of Fill Material Placement:

_____

_____

Signature of Property Owner(s): Phone: _____

_____

_____

Name of Project Where Material Originated:

_____

Name of Contact/Representative: Phone: _____

_____

Signature of Project Contractor/Representative:

_____

Signature of City of Anna Representative:

_____

City Engineer Comments:

_____

_____

(SEE BACK FOR INSTRUCTIONS)

EXHIBIT 7.1

INSTRUCTIONS FOR
CITY OF ANNA FILL REQUEST

I. Permanent Placement

A. Grading Plan prepared by Professional Engineer registered in the State of Texas. Grading plan should have proposed and existing topography, including creeks, draws, floodplains and existing tree locations.

B. Limits of fill to be staked in the field.

C. Erosion control shall be in the form of an approved SW3P.

D. No fill in drainage ways, floodplains, or wetlands.

E. No trees to be removed without approval of City Planning Department.

F. Maximum slope is 3:1.

G. Grass to be established within 21 days of placement.

H. Compaction to be 95% density using a sheep foot roller in 8" to 12" lifts.

I. Density to be verified by certified materials testing lab.

2. Temporary Stockpiling

A. A stockpile location map shall be prepared by engineer showing stockpile location, existing topography, including existing creeks, draws, floodplains, and tree locations.

B. Items 1-B through 1-G shall apply.

C. Material may not be spread without City approval.

D. If stockpile material is decided to be used as permanent fill material, it shall be re-spread and placed per 1-H and 1-I.

3. Signatures

A. Property owner must sign permit.

B. All Contractors furnishing material to the site shall sign the Fill Material Permit and have a copy at the receiving site or on each truck.

C. Contractors without a signed permit shall be turned away from the site.

4. Miscellaneous

A. Violations of this permit can result in citations for owner and dirt generator with fines up to $2,000.00 per violation.

B. City will inspect dirt placement.

C. All fill material placed is to be relatively clean and free form debris.

CATMIS102 Fill Request
CAT/em

EXHIBIT 7.1 Cont'd.

7.4 Additional Permits or Approvals

Developer or developer's representative is responsible for obtaining any other approvals or permits needed for their development, for example: TCEQ, FEMA, etc. prior to start of construction. Permitting from TxDOT must be through the City. The developer shall be responsible to prepare all necessary studies and documents required to complete this process. Copies of the permits/approvals shall be furnished to the City.

7.5 Retaining Walls

A. Retaining walls or concrete slope protection shall be installed where lot slope is greater than 3:1.

B. No railroad tie retaining walls shall be constructed.

C. All retaining walls shall be stone, masonry or reinforced concrete.

D. Retaining walls four feet (4') and higher shall be designed and inspected by a Professional Engineer registered in the State of Texas, and an engineering report furnished to the City.

E. Gabion retaining walls may be used only with City's Engineer's approval for walls less than four feet (4') along drainage ways.

Section 8.A. STANDARD SPECIFICATIONS (see Section 8.B. for modifications to these specifications).

MATERIALS AND CONSTRUCTION METHODS

STANDARDS:

All work shall be performed in accordance with the Standard Specifications for Public Works Construction - North Central Texas, 4th Edition, dated 2004, except where noted otherwise in the City of Anna's supplemental "Special Provisions", the Special Conditions, and the Special Specifications included herein.

NOTE: The * symbol specifies that this item is also covered in the City of Anna's "Special Provisions" to the "Standard Specifications for Public Works Construction, North Central Texas". These Special Provisions are additional and modify the "Standard Specifications" – see Section 8.B.

Section 8.B. MODIFICATIONS TO STANDARD SPECIFICATIONS

CITY OF ANNA, TEXAS

SPECIAL PROVISIONS
TO THE
NORTH CENTRAL TEXAS STANDARD SPECIFICATIONS
FOR PUBLIC WORKS CONSTRUCTION

MATERIALS AND CONSTRUCTION METHODS

The North Central Texas Standard Specifications as referenced or set forth in Section 8.A. shall be modified and clarified by the addition of the following requirements to the various items. Except when specifically stated, none of the requirements shall be deleted.

DIVISION 200 – SITE PROTECTION AND PREPARATION

ITEM 201.16 MULCHING

Slope and drainage channel seeding shall be in conformance with Item 201.16. Hydromulch Seeding mixture and rate shall be as required under Item 202.6:

ITEM 202.2 TOPSOIL

202.2.3. Construction Methods

Add the following:

A minimum of four (4) inches of topsoil shall be provided on all major thoroughfare medians and rights-of-way and on all earthen channel slopes. This will be material imported from off site. The City will approve material prior to placement.

ITEM 202.6 SEEDING TURF-GRASS

Delete the mixture, rate, and planting dates and substitute:

Type I Unhulled Perennial Bermuda: Reserve and Spangle Top Grass Seeds (September – March)

Type ll: Perennial Bermuda Grass – Unhulled: (April – August)

A mix of seed shall be used in overlapping seasons.

202.6.4 Construction Methods

Add as follows:

All seeding operations shall be performed by either “Drilling” or “Cultipacker” process or approved equivalent. Seed shall be covered by + ¼” Topsoil.

202.6.4.1 Description

Add the following:

The Contractor shall maintain the seeded areas including watering until a “Stand of Grass” is obtained. A “Stand of Grass” shall consist of **75% to 80%** coverage, a minimum of one (1) inch in height. Re-seeding will be required in washed areas.

ITEM 203.3 GENERAL SITE PREPARATION

203.3.2 Construction Methods

Add the following: Unless otherwise approved in writing by the City of Anna, where excavation to grade established in the field by the Owner terminates in loose or solid rock, the Contractor shall excavate 6-inches below the required subgrade elevations for the entire roadbed width and shall backfill with suitable selected materials as indicated on the plans. Suitable selected material shall include lime treated subgrade or a base material having a plasticity, index not greater than 12. Payment for such work will be made under the items of unclassified street excavation, lime treated subgrade and hydrated lime. The 6-inch lime treated subgrade or base shall be compacted to 95% density.

ITEM 203.7 EMBANKMENT

203.7.2 Construction Methods

Add the following paragraph: Excavated material from the channel which is used as embankment to complete the established alignment, grade and cross-section of the channel shall be compacted to 95% density.

203.7.3 Density

Add: Embankment in the City of Anna shall be compacted to not less than 95% of the maximum density.

DIVISION 300 – ROADWAY CONSTRUCTION

ITEM 301 SUBGRADE, SUB-BASE & BASE PREPARATION

301.1 General

Construction Methods

Add the following: Prior to final compaction of subgrade, samples of the subgrade material shall be collected by a testing laboratory approved by the City, and laboratory tests made to determine the amount of lime required.

The application rate for hydrated lime shall be selected to obtain at least the optimum lime percentage indicated by test method ASTM C977-83a, Appendix Xl; however, not less than 27 lbs. per S.Y. shall be applied. A Geotechnical Engineer's report reflecting the recommended application rate and including supporting test data shall be submitted in writing to the City, for approval prior to beginning any lime treatment. Laboratory test may be waived provided a minimum of 36 lbs. per S.Y. is applied.

ITEM 301.2 LIME TREATMENT (Add the following)

The lime treated subgrade shall be moist cured until covered by other base or pavement up to fourteen (14) days after final compaction. After 14 days without covering an application of 0.10 to 0.20 gallons per square yard emulsified asphalt shall be applied at the Contractor's expense. Reapplication of emulsified asphalt may be required if lime treated subgrade is not covered shortly after first application. Lime treated subgrade may be covered by other base or Pavement when density of 95% of maximum at optimum moisture content is obtained.

301.2.1.2 Quicklime (dry) shall not be used in the construction of roadway work in the City.

ITEM 301.3 PORTLAND CEMENT TREATMENT

Add the following: Portland cement modification of subgrade soils is not approved in Anna. Subgrade soils means natural ground or embankment encountered in the construction.

ITEM 301.5 FLEXIBLE SUB-BASE OR BASE (CRUSHED STONE / CONCRETE)

General: Add the sentence: No local limestone material shall be used as flexible base (crushed limestone) on Anna paving projects, unless. otherwise shown on the plans.

ITEM 302 ASPHALT PAVEMENT

ITEM 302.2 AGGREGATE FOR HOT-MIX ASPHALT PAVEMENT

Central Mixing Plant

Add the following: When a fly ash admixture is used with Type I cement in the production of Portland cement concrete, separate silos shall be provided for fly ash and cement and provisions shall be made for individual measurements.

Finishing

Add the following: The finished concrete pavement construction under these specifications is expected to meet certain quality standards for surface of the concrete including the durability, texture, riding surface and appearance. The surface must be durable, firm, dense and well bonded to the aggregate to maintain an appearance and texture which is satisfactory to the Owner. Concrete pavement having a poor surface which has spalled (exposed aggregate) due to poor quality paste, high water-cement ratio, over-vibration, improper curing, extreme weather or any other reason, or does not have a satisfactory riding surface shall be removed and replaced at the Contractor's expense. It is extremely important that the Pavement have a good rideable surface, free from undulations and rough joints. The City Engineer shall determine the acceptability of the Pavement.

- Machine Finishing

  Machine finishing of pavement shall include the use of power-driven spreaders, reciprocating type power-driven vibrators, power-driven transverse strike-off, and screed.

  The concrete pavement shall be consolidated by a reciprocating type mechanical vibrator. As soon as the concrete has been spread between the forms, the mechanical vibrator shall be operated to consolidate the concrete and remove all voids. Hand manipulated vibrators shall be used for areas not covered by the mechanical vibratory unit.

  The transverse finishing machine shall first be operated to compact and finish the pavement to the required section and grade, without surface voids. The machine shall be operated over each area as many times and at such intervals as directed. At least two trips will be required and the last trip over a given area shall be a continuous run of not less than 40 feet. After completion of finishing with the transverse finishing machine a transverse drag float may be used.

  After the floating has been completed and the excess water removed, but while the concrete is still plastic, the surface of the concrete shall be tested for trueness with an approved 10-foot steel straightedge furnished by the Contractor. The straightedge shall be operated from the side of the pavement, placed parallel to the pavement centerline and passed across the slab to reveal any high sports or depressions. The straightedge shall be advanced along the pavement in successive stages of not more than one-half its length. Practically perfect contact of the straightedge with surface will be required, and the pavement shall be leveled to this condition, in order to insure conformity with the surface test required below after the pavement has fully hardened and to insure a smooth rideable surface. Any correction of the surface required shall be accomplished by adding concrete if required and by operating the longitudinal float over the area. The surface test with the straightedge shall then be repeated.

  After completion of the straightedge testing and surface correction the surface of the pavement shall be finished by an approved method. Methods available for pavement surface finish including a burlap drag finish, a broom finish or a belt finish. Unless otherwise shown on the plans, the pavement surface shall be finished with the burlap drag.

a. Burlap Drag Finish

If the surface texture is to be a drag finish, a drag shall be used; it shall consist of a seamless strip of damp burlap or cotton fabric, and it shall produce a uniform surface of gritty texture after dragging it longitudinally along the full width of pavement. For pavement 16 feet or more in width, the drag shall be mounted on a bridge which travels on the forms. The diameter of the drag shall be such that a strip of burlap or fabric at least 3 feet wide is in contact with the full width of pavement surface while the drag is used. The drag shall consist of not less than two layers of burlap with the bottom layer approximately 6 inches wider than the upper layer. The drag shall be maintained in such a condition that the resultant surface is of uniform appearance and reasonably free from gravels over 1/16-inch in depth. Drags shall be maintained clean and free from encrusted mortar. Drags that cannot be cleaned shall be discarded and new drags substituted.

b. Broom Finish

If the surface texture is to be broom finished, it shall be applied when the water sheen has practically disappeared. The broom shall be drawn from the. center to the edge of the pavement with adjacent strokes slightly overlapping. The broom operation shall be so executed that the corrugation. produced in the surface shall be uniform in appearance and not more than 1/16-inch in depth. Brooming shall be completed before the concrete is in such condition that the surface will be torn or unduly roughened by the operation. The surface thus finished shall be free from rough and porous areas, irregularities, and depressions resulting from improper handling of the broom. Brooms shall be of the quality, size, and construction and shall be operated to produce a surface finish meeting the approval of the Owner. Subject to the approval of the Owner, the Contractor may be permitted to substitute mechanical brooming in lieu of the manual brooming as herein described.

c. Belt Finish

If the surface texture is to be belt finish, when straightedging is completed and after sheen has practically disappeared and just before the concrete becomes non-plastic, the surface shall be belted with a 2-ply canvas belt not less than 8 inches wide and at least 3 feet longer than the pavement width. Hand belts shall have suitable handles to permit controlled, uniform manipulation. The belt shall be operated with short strokes transverse to the centerline and with a rapid advance parallel to the centerline.

- Hand Finishing

Hand finishing of concrete pavement will be' permitted in areas where it is not practical or possible to construct with finishing machines. These areas include, but are not limited to, intersections, left turn, lanes, crossovers, transition areas and where the pavement width is not uniform. In all hand finished areas, one-half (½) extra sack of cement per cubic yard of concrete shall be used in the mix. In hand finished areas, the concrete shall be struck off with an approved strike-off screed to such elevation that when consolidated and finished the surface of the pavement shall conform to the required section and grade. The strike template shall be moved forward with a combined transverse and longitudinal motion in the direction the work is progressing, maintaining a slight excess of material in front of the cutting edge. The concrete shall then be tamped with an approved tamping template to compact the concrete thoroughly and eliminate surface voids and the surface screeded to required section. After completion of a strike-off,

consolidation and transverse screeding, a hand-operated longitudinal float shall be operated to test and level the surface to the required grade.

Workmen shall operate the float from approved bridges riding on the forms and spanning the pavement. The longitudinal float shall be held in contact with the surface and parallel to the centerline and operated with short longitudinal strokes while being passed from one side of the pavement to the other. If contact with the pavement is not made at all points, additional concrete shall be placed, if required, and screeded, and the float shall be used to produce a satisfactory surface. Care shall be exercised to keep the ends of the float from digging into the surface of the pavement. After a section has been smoothed so that the float maintains contact with the surface at all points in being passed from one side to the other, the bridges may be moved forward half the length of the float and the operation repeated. Other operations and surfaces tests shall be as required for machine finishing.

- Edging at Forms and Joints

  After the final finish, but before the concrete has taken its initial set, the edges of the pavement along each side of each slab, and on each side of transverse expansion joints, formed joints, transverse construction joints, and emergency construction joints shall be worked with an approved tool and rounded to the radius required by the plans. A well-defined and continuous radius shall be produced and a smooth, dense mortar finish obtained. The surface of the slab shall not be unduly disturbed by tilting of the tool during use.

  At all joints, any tool marks appearing on the slap adjacent to the joints shall be eliminated by brooming the surface. In doing this, the rounding of the edge shall not be disturbed. All concrete on top of the joint filler shall be completely removed.

  All joint shall be tested with a straightedge before the concrete has set, and correction shall be made if one side of the joint is higher than the other or if they are higher or lower than the adjacent slabs.

ITEM 303 PORTLAND CEMENT CONCRETE PAVEMENT

ITEM 303.8 PAVEMENT TESTING AND EVALUATION

303.8.2 Pavement Thickness Test

Delete in its entirety and substitute therefore the following:

Upon completion of the work and before final acceptance and final payment shall be made, pavement thickness tests shall be made by the Contractor. Tests shall be made at 400-foot spacings along the length of the pavement. In the event a deficiency in the thickness of pavement is revealed, two (2) subsequent sets necessary to isolate the deficiency shall be made - one at a jointed section prior to the deficient station and one at a jointed section following the deficient station. Additional tests shall be obtained as necessary, at jointed section intervals to isolate the deficient area. Removal and replacement of concrete shall extend to joint boundaries, the full width of pavement section. If the average thickness of pavement in a particular section is less than called for on the plans, the pavement section shall be removed and replaced with the correct thickness, extending to joint boundaries, the full width of the pavement section, at the Contractor's entire

expense. No additional payment over the contract unit price shall be made for any pavement of a thickness exceeding that required on the plans.

303.8.3 Pavement Strength Test

Revise the first paragraph to read: During the progress of the work, the Inspector or a commercial laboratory shall cast test cylinders or beams to maintain a check on the strengths of the concrete being placed.

Add to the 5th paragraph: Test cores shall be obtained within five (5) working days after the 28-day test results have been provided by the commercial laboratory. All test cores shall be obtained by a commercial laboratory, at the Contractors expense. One (1) core shall be obtained in the immediate area of the deficiency and two (2) additional cores shall be obtained - one at a jointed section prior to the deficient station and one at a jointed section following the deficient station. Additional cores shall be obtained as necessary, at jointed section intervals to isolate the deficient area. Removal and replacement of concrete shall extend to joint boundaries, the full width of pavement section.

Amend the 2nd paragraph on Page 217 to read "Pavement not meeting the minimum specified 28-day strength after cores have been tested shall be removed and replaced at the Contractor's expense."

ITEM 305 MISCELLANEOUS ROADWAY CONSTRUCTION

ITEM 305.1 CONCRETE CURB AND GUTTER

305.1.3.2 Reinforcing Steel

All bars at splices shall be lapped a minimum of 30 diameters of the bar or 12-inches, whichever is greater.

ITEM 305.2 CONCRETE SIDEWALKS, DRIVEWAY APPROACHES, & BARRIER FREE RAMPS

305.2.2.2 Reinforcement

Revise the first sentence to read:

Driveway approaches and walk reinforcing shall be No. 3 bars on 18-inch centers.

305.2.3 Construction Methods

General: Add to end of first paragraph:

The drive approach shall have a minimum thickness equal to the thickness of the adjacent street or 6 inches, whichever is greater.

305.2.3.7 Joints

Revise second sentence to read:

Expansion joints shall be placed in the sidewalk at 20-foot intervals or as otherwise specified by the Owner.

DIVISION 400 – ROADWAY MAINTENANCE AND REHABILITATION

DIVISION 500 – UNDERGROUND CONSTRUCTION & APPURTENANCES

ITEM 501 UNDERGROUND CONDUIT MATERIALS

ITEM 501.4 CONCRETE PRESSURE PIPE AND FITTINGS

C302 Reinforced Concrete Pressure Pipe, Non Cylinder Type, for Water and Other Liquids, and C300 Reinforced Concrete Pressure Pipe, Steel Cylinder Type, for Water and Other Liquids are not approved for use in the City, unless otherwise shown in the plans or approved in writing. Reinforced concrete cylinder pipe in sizes 16 inches through 21 inches shall be Pretensioned Pipe Type C303. For pipe 42 inches in diameter and above the pipe shall be Prestressed Pipe Type C301. Between 24 inches and 36 inches the pipe furnished may be either type. All pipe shall be designed to withstand the working pressure and external load as shown in the plans.

ITEM 501.5 REINFORCE CONCRETE WASTEWATER PIPE WITH RUBBER GASKET JOINTS

ASTM Designation C76 and shall be of the Thick Wall Pipe design with aggregates consisting of limestone aggregate in the proportion of at least 75 percent by weight of the total aggregates, unless otherwise provided in the Special Conditions to the Specifications.

ITEM 501.7 DUCTILE-IRON PRESSURE PIPE AND FITTINGS (Add the Following)

Minimum design thickness for all Ductile-Iron Pipe installed shall be Class 50 on sizes 12 inches and smaller, and Class 51 on sizes 14 inches and larger.

ITEM 501.9 STEEL PIPE AND FITTINGS

501.9.2 Applicable Standard Specifications (Add the following)

Contractor shall, submit a written certification that the pipe has been manufactured and tested in accordance with the applicable standards.

The pipe shall be manufactured, fabricated, coated and lined by a single manufacture being a certified member in good standing of the Steel Plate Fabricators Association (SPFA).

501.9.3 Pipe and Fitting Requirements

Substitute the following for the sentence following (2) Wall Thickness: All steel pipe to be furnished for this project shall be designed in accordance with AWWA Ml 1 for the most critical application of internal pressures and external loads. The following design conditions shall apply:

Internal Pressure (Design to account for working and surge together)

1) Working Pressure of 200 psi
2) Surge allowance of 250 psi

External Loading for Buried Pipe

1) External loads shall be comprised of the weight of the backfill together with live and' impact loads. Earth loads shall be calculated based on ditch and positive projecting conduit. The earth load for the pipe design shall be the greater of the above two conditions.

2) External live loads shall be at least equivalent to AASHTO HS-20 loading.

3) Modulus of soil reaction (E') < 1000 psi

4) Unit weight of fill (w)> 120 pcf

5) Deflection lag factor (Dl) (1.0)

6) Bedding constant (K) = 0.100

7) hw = h = depth of cover above top of pipe

8) Maximum deflection in percent of pipe diameter 'shall be ad determined by AWWA Ml 1, latest edition, as calculated using moment of inertia of steel cross section of pipe wall. Moment of inertia of cement mortar shall not be included in calculation of maximum deflection.

Available Deflections

Mortar-lined and coated = 2 percent of pipe diameter

Maximum Working Stress

The maximum combined stress based on working pressure shall be no greater than 50 percent of the minimum yield strength or 18,000 psi, whichever is less.

The maximum combined stress based on test pressure shall be no greater than 75 percent of the minimum yield strength or 24,000 psi, whichever is less.

501.9.4 Joints: Add the following:

In general, pipe joints shall be as follows, as indicated on the Drawings or as specified.

1) Flanged joints shall be provided as a minimum at all flanged valves, meters and other equipment.

   a. Flanges: Unless otherwise noted, flanges shall conform to the requirements of AWWA C207, Table D, E or F as required.

   b. Flange Bolts and Nuts: Shall be furnished in size and numbers stipulated in AWWA C207. Unless otherwise indicated, bolts shall be carbon steel to meet the requirements of ASTM Designation A307, Grade B for regular joints.

2) Restrained Lap-Welded slip joints (expanded bell) with a single fillet weld.

3) Carnegie-Shape Rubber Gasket Joint: Bell and spigot rubber gasket joint will be furnished with the bell end of the pipe mechanically expanded to the required internal diameter and the spigot end furnished as a sized Carnegie shape welded to the opposite end of the pipe. The expanded bell and Carnegie spigot shall be designed such that when the pipe is laid and jointed, it will be self-centered, and the 0-ring rubber gasket will be enclosed tightly on all four sides and confined under compression adequate to ensure watertightness.

Gaskets to be full-face for use with flat face flanges and ring type for use with raised face flanges. Gasket material for water service pipe shall be cloth inserted rubber sheet, 1/8-inch thick or red rubber, ASTM D1330, Grade 1. Gasket material for air piping shall be as above, but of EPDM.

4) Mechanical Couplings: Mechanical couplings designed to provide a stress relieving flexible joint shall consist of a cylindrical sleeve, two gaskets, two follower rings and a set of bolts and nuts.

   a. Sleeves: Manufactured of ASTM A53 steel, for sizes 10-inches and smaller. ASTM A36 steel for sizes 12-inches and larger. Minimum sleeve length shall be five inches for pipe 12-inches and smaller, 7-inches for pipe 14-inches through 24-inches, and 10-inches for pipe larger than 24-inches.

   b. Follower Rings: Ductile Iron ASTM A536 or AISI Cl 020 Steel.

   c. Bolts and Nuts: High strength low alloy steel with heavy semi-finished hexagon nuts.

   d. Gaskets: Shall be of synthetic rubber suitable for operating conditions.

   e. Shop Finish: Manufacturer's standard unless otherwise noted.

   f. Manufacturer: 'Baker 200, Dresser Style 39, Rockwell Series 411 or approved equal.

ITEM 502.3 FIRE HYDRANTS

502.3.1 Materials

All fire hydrants furnished shall be Muller or Clow, and shall conform strictly with the latest specification C-502 of the American Water Works Association Standards for dry barrel fire hydrants and must comply with the following supplementary details and changes or addition.

(a) Inlet Connection: Unless otherwise specified the inlet connection shall 'be a six (6) inch standard mechanical joint complete with all joint accessories. The inlet shoe shall be cast of the same or stronger metal than the lower barrel to prevent impact damage of the shoe. The interior of the shoe, including the lower valve plate and/or cap nut shall have a protective epoxy coating of at least 4 mils applied in the shop. If a cap nut is utilized it must be locked in place with a stainless steel lock washer or similar non-corrosive device and all machined surfaces must be protected from water intrusion to prevent corrosion and assure ease of field teardown or maintenance.

(b) Main Valve: The main valve shall be reversible compression type, closing with the pressure and shall be not less than 5-1/4" in diameter. Composition of the main valve shall be molded rubber or neoprene having a durometer hardness of 90 $\pm$ 5 and shall be not less than 1" thick to protect against hydrant chatter and give long term durability.

(c) Outlet Nozzles: All hydrants shall be “three way”, equipped with two hose nozzles and one pumper nozzle.

(d) Diameter Outlet Nozzles: The hydrant shall have two hose nozzles, two and one-half (2-1/2”) inches nominal I.D., and one pumper nozzle four and one-half (4-1/2”) inches nominal I.D. with Natural Standard Hose Threads.

(e) Nozzle Attachment: All nozzles shall be mechanically connected into the barrel and have “0” Ring pressure seals to provide a positive seal between nozzles and hydrant barrel. A suitable nozzle lock shall be provided and shall be stainless steel or bronze. Nozzles shall not be caulked in.

Nozzle caps shall be furnished with pentagon nut the same size as the operating nut. They shall be furnished with interior rubber gaskets that will seat against bronze nozzles. All caps shall be secured to hydrant barrel by heavy duty non-kinking chains with a chain loop on each cap that permits free turning of the cap, for speed and ease of removal by fire fighters.

(f) Operating Nut: The operating nut shall be non-rising, pentagonal shape, measuring 1-1/8” at the top and 1-1/4” at the base from point to flat. Pentagon shall have a depth of at least one and one-quarter inch (1-1/4”). The hydrant shall be constructed in such a manner that the operating nut, “0” Rings and washers can be removed and replaced without removing the bonnet. All bearing surfaces of the operating nut shall be bronze.

(g) Holddown Nut: Holddown nut must have intregal weather seal. Resilient seal between holddown nut and operating nut shall prevent debris entry to protect operating nut from damage.

(h) Lubrication Reservoir: The hydrant shall have a completely “0” Ring sealed oil reservoir with a minimum of two (2) “0” Ring pressure seals to prevent contamination of the oil around the operating parts of the hydrant. The oil reservoir shall be cast in such a manner that all operating parts shall be repairable without removal of the bonnet to facilitate repairs and shall be of a design that all bearing surfaces and threaded parts will be automatically lubricated upon each operation of the hydrant. If bearing surfaces are not lubricated, the design shall keep operating friction to a minimum. A high wear resistant thermoset plastic anti-friction washer shall be in place above the thrust collar to minimize operation torque and facilitate long term ease of operation~ The operating threads must be sealed against contact with water to all times regardless of open or closed position of main valve. The hydrant shall have the capability of field personnel to visually. check oil level and add additional oil if needed. Filler and inspection plug shall be recessed or flush type.

(i) Traffic Feature: Hydrants shall be “traffic model” having upper and lower barrel joined approximately two inches (2”) above the groundline by a breakable “swivel” flange providing 360 degree rotation of the upper barrel for nozzle positioning and must be capable of rotating barrel with line pressure on. The groundline shall not be less than

eighteen inches (18") below the centerline of the lowest nozzle and shall be clearly marked in a permanent manner on the lower barrel. A breakable stainless steel stem coupling shall join the two-piece stem adjacent to the ground line flange. Screws, clevis pins, fasteners or bolts used in the coupling shall be Series 300 stainless steel. The weakened portion of the stem coupling shall be located to divert pressure from the stem coupling directly to the upper and lower stems when torque is applied in seat ring removal.

Design of the coupling shall be such that when the coupling is broken, no part of the coupling will shatter or come loose and fall into hydrant and the break will not occur through the pins or bolts holding the coupling to the stem.

(j) Drain Valve Assembly: Hydrants shall be equipped with two drain valves which drain the barrel when the hydrant is closed and seal shut when the hydrant is in the open position. The upper valve plate,' seat ring and drain ring (shoe bushing) must be bronze and work in conjunction to form an all bronze drainway. Upper valve plate if not bronze, must be epoxy coated.

The bronze seat ring shall be a minimum 5-1/4" inside diameter and shall thread into a bronze drain ring forming an all bronze drainway with two (2) drain outlets for double protection against drain clogging and corrosive damage. All bronze components shall have less than 16% zinc alloy, Grade A to give high corrosion resistance as recommended 'in Section 2.1, Table I of American Water Works Association Standard C-502. Seat ring seals shall be "0" Rings. Hydrant shall be designed so that during opening and closing operation(s), water pressure force flushes the drain valve and drain openings to prevent clogging, thus allowing barrel drainage:

(k) Repair: All internal operating .parts shall be removable from above ground level with a' lightweight stem wrench.

(I) Provisions for Extension: All hydrants shall be capable of being extended to accommodate future grade changes without excavation. Extension of the hydrant shall be made by adding at the groundline flange a new coupling and stem section equal to the length of the extension. This must facilitate easy field grade adjustment.

Stem extensions made by adding new section of stem to the threaded section of the stem at the top of the hydrant will not be' accepted.

Extension kits must be available from manufacturer in six-inch (6") increments.

(m) Pressure Loss and Working Pressure: Pressure loss through one (1) four and one-half inch (4-1/2") nozzle at 1000 GPM shall not be more than 5.0 psi.

ITEM 502.6 VALVES

502.6.2 Resilient-Seated Gate Valves for Ordinary Water Works Service

Unless otherwise approved in writing, all Gate Valves for direct buried service in the City's distribution system, 6 inches through 12 inches in diameter, shall be Resilient Seated Gate Valves that conform strictly with the latest specification C-509 of the American Water Works Association Standards and must comply with the following supplementary details, changes or additions.

(a) Body: Gate valves shall be iron body designed for a working pressure of 250 psi. All valves shall be hydrostatically tested at 200 psi and shell tested at 500 psi. Any leakage during testing shall be cause for rejection. For ease of repair the body, bonnet and stuffing box shall be flanged together with ASTM Grade B bolts and nuts. Each valve shall have the maker's initials, pressure rating, and year in which manufactured cast in the body.

(b) Stems: Stems shall be machined from manganese bronze rod with an integral forged thrust collar machined to size. The stems shall be non-rising and equipped for nut operation, which shall be opened by turning to the left.

(c) Stem Seals: The seals shall consist of two "0" rings above and one "0" ring below the thrust collar. An anti-friction washer shall be located above and below the thrust collar for operating torque.

(d) Stem Nut: The stem nut shall be ASTM'B-62 bronze.

(e) Resilient Wedge: The wedge shall be cast iron, fully encapsulated in molded rubber complying with ASTM D2000. Wedge must have molded wedge guides preventing the disc from tilting downstream during operation. Protective guide cap bearings made of polymer bearing material to provide a bearing interface between the wedge guide and valve interior.

(f) Paint and Protective Coatings: All valves furnished under these specifications shall be painted on the exterior as specified in AWWA C509 with asphalt varnish.

All ferrous metal surfaces in the internal part of the valve shall be protected with a fusion epoxy coating 'to a nominal thickness of 10 mils for corrosion protection and shall be of a color that is easily identified as an epoxy coating.

The proguard fusion epoxy coating shall fully comply with AWWA C550 .and certified NSF 61. The coating shall be 'non-toxic and shall not impart taste to water. The coating must be formulated from materials deemed acceptable per the Food & Drug Administration Document Title 21 of the Federal Regulations of Food Additives, Section 121.2514 entitled Resins and Polymeric Coatings. The coating shall 'have a satin finish and shall be suitable for field overcoating and touchup with the same coating' material without sanding or special surface preparation, or application of heat in excess of room temperature.

(g) Experience and Certification: Valves, furnished under these specifications, shall be manufactured by a firm that has been

producing valves of this general type continuously for. the past ‘five (5) years. Each company or. manufacturer supplying valves under these specifications shall have on file, with the City of Anna, approved records of experience and detailed drawings of the proposed valves. Drawings shall cover the specific valve to be furnished for installation and shall show all dimensions including metal thickness, construction details and materials used in all parts of the valve together with ASTM Designation and Structural properties of these materials.

The manufacturer shall furnish to the City of Anna, a Certification that the valve complies with the specifications without any exceptions. This certification shall apply to specific valves being installed within the City water distribution system. The certification shall state (1) the number of valves covered by the certifications, (2) the Addition where valves are being installed or the Project Name, and (3) name of Contractor installing valves.

The City may require the Manufacturer, Supplier or Contractor to dismantle valves at any time to determine compliance with these specifications. Location of any valve within the City system, installed after adoption of these specifications, that does not meet the specifications completely shall be cause for prohibiting the future use of any valves from the same manufacturer.

(h) Tapping Sleeves: The materials for tapping sleeve bodies shall be cast-iron or ductile-iron in accordance with AWWA Standard Cl 10 (ANSI 21.10), in two sections, or halves to be bolted together with high-strength, corrosion resistant, low alloy steel bolts conforming to AWWA Standard C111 (ANSI 21.11).

Cast iron and ductile-iron sleeve shall be mechanical joint, or as specified, or dimensions to secure, proper fit on the type and class of pipe on which they are to be used. Each sleeve shall be furnished with a 3/8-inch test opening so that tests can’ be made prior to tapping. Opening shall be provided with a 3/8-inch bronze plug.

502.6.5 Butterfly Valves (Add the Following)

All Butterfly Valves for installation underground in the City’s distribution system 16 inches through 48 inches shall be in accordance with this specification.

All butterfly valves furnished shall conform strictly with the latest specification C-‘504 of the American Water Works Association Standard for rubber-seated butterfly valves and must comply with the following supplementary details and changes or addition.

(a) Body: The body shall be cast-iron ASTM A126, Class B and shall have face ‘to face dimensions in accordance with AWWA Standards for short body, Class ‘150-B. All butterfly valves shall have a floating body seat ring to compensate for change in direction of flow to assure bottle-tight seal in either direction.

(b) Shaft: Valve shafts shall be an 18-8, Type 304 stainless steel. Valve disc and shaft shall be standard self-adjusting Chevron “V” type

packing. Shaft seals shall be of a design allowing replacement without removing the valve shaft.

(c) Disc and Seat: The valve disc shall be cast iron ASTM A126, Class B. The valve seat shall be Buna-N located on the valve body. Valves 20" and smaller shall have a bonded seat that meets test procedures in ASTM D429, Method B. Valves 24" and larger shall be retained in the valve body' by mechanical means without the use of metal retainers or other devices located in the flow stream.

(d) Operator: Butterfly valve operators shall be of the traveling nut design. All operators shall have adjustable mechanical stop limiting devices to prevent over travel of the disc. The operator shall have a mechanical stop which will withstand an input torque of 450 Ft. lbs. against the stop. The traveling nut shall engage alignment grooves in the housing.

(e) Operation: Unless otherwise shown in the plans, all valves shall open counter clockwise.

(f) Valve Ends: Valve ends shall be Mechanical Joint End, or Flanged Ends. Mechanical joint valves shall come complete with bolts, nuts, gaskets and glands. It shall be the responsibility of the Contractor to coordinate the ends of the adjoining pipe with the type valve end he proposes to use.

(g) Testing: All valves seats shall be tested at 150 psi as described in AWWA C-504 and in addition shall have a shell test of 300 psi. Any leakage shall be cause for rejection.

(h) Paint and Protective Coatings: All butterfly 'valves furnished under these specifications shall be painted on exterior as specified in AWWA C-504, with asphalt varnish.

All ferrous metal surfaces in the internal part of the valve shall be protected with a two-part thermoset epoxy coating to a nominal thickness of 4 mils for corrosion protection and shall be of a color that is easily identified as an epoxy coating. This shall be applied in shop.

The thermoset epoxy coating shall be a two-part epoxy and shall function as a physical, chemical and electrical barrier between the base metal to which it is applied and the surroundings. The coating shall be non-toxic and shall not impart taste to water. The coating must be formulated from materials deemed acceptable per the Food & Drug Administration Document Title 21 of the Federal Regulations of Food Additives, Section 121 .2514 entitled Resins & Polymeric Coatings. The coating shall have a satin finish and' shall be suitable for field overcoating and touchup with the same coating material without sanding or special surface preparation, or application of heat in excess of room temperatures.

(i) Experience and Certification: Butterfly valves, furnished under these specifications, shall be manufactured by a firm that has been producing valves of this general type continuously for the past five (5) years. Each company or manufacturer supplying valves under these specifications shall have on file, at the City of Anna, approved records

of experience and detailed drawings of the proposed valves. Drawings shall cover the specific valve to be furnished for installation in the City of Anna and shall show all dimensions including metal thickness, construction details and materials used in all parts of the valve together with ASTM Designation and structural properties of these materials.

The manufacturer shall furnish to the City, a Certification that the valve complies with the specifications without any exceptions. This certification shall apply to specific valve being installed with the City water distribution system. The certification shall state (1) the number of valves covered by the certification, (2) the Addition where valves are being installed or the Project Name and (3) name of Contractor installing valves.

The City may require 'the Manufacturer, Supplier or Contractor to dismantle valves at any time to determine compliance with these specifications. Location of any valve with the City system, installed after adoption of these specifications, .that does not meet the specifications completely shall be cause for prohibiting the future use of any valves from the same manufacturer.

ITEM 504 OPEN CUT - BACKFILL

ITEM 504.2 MATERIALS

504.2.2.1 Add the following sentence:

All stone used for pipe embedment shall be standard crushed rock-aggregate, Grade 4, unless otherwise approved in writing.

ITEM 504.3 EXCAVATION AND FOUNDATION

Prior to start of excavation the Contractor shall remove and stockpile the Topsoil and protect the Topsoil from contamination during construction.

After the trench has been refilled, topsoil shall be replaced to the extent that rock, excavated from the trench, will be completely covered and the area is returned to its original condition, except that in cultivated areas a minimum of 12 inches of top soil shall be replaced.

ITEM 504.4 BACKFILL – GENERAL REQUIREMENTS

The material used in the backfill shall be pulverized to the extent necessary to produce, a free flowing material free of clay balls larger than 6-inch diameter.

ITEM 504.5 EMBEDMENT (Add the Following)

Rock Cuttings or Sand will not be permitted in the pipe bedding for sanitary sewer or water lines in the City of Anna.

504.5.2.15 Class "H" Embedment:

The embedment consists of a completely encased pipe with Standard Crushed Stone, Grade 4. Class "H" Embedment shall be used on the P.V.C. Sanitary Sewer Pipe installed within the City of Anna.

After the trench has been cut to a depth below the barrel of the pipe a distance of 1/8 Bc (3 inches minimum and 6 inches maximum), the bedding layer shall be brought to a point slightly above grade with compacted crushed stone. Bell holes shall be formed and the pipe laid and joined as specified. The stone shall be brought up in uniform layers of six inches to a point six inches over the top of the pipe when compacted. On PVC Pipe 18 inches through 27 inches in diameter the crushed stone shall be brought up in uniform layers to a point nine inches over the top of the pipe when compacted.

ITEM 506 OPEN CUT – WATER CONDUIT INSTALLATION

506.3 Laying Water Conduit

Valves for installation in the City's distribution system shall be installed by direct burial as shown on the standard detail sheets and shall be provided with valve boxes for operation of the valve.

506.5 Hydrostatic Test:

All hydrostatic tests shall be maintained over a period of not less than four hours.

"Before being accepted, all ductile iron, C-900 PVC or concrete cylinder water mains shall be tested with a hydraulic test pressure of not less than four hours. Concrete pressure pipe shall be tested with a hydraulic test pressure of 120 percent of the design pressure. Steel pressure pipe shall be tested with a hydraulic test pressure not to exceed 150 percent and not less than 120 percent of the designed working pressure. The rate of leakage of all pipe tested shall not exceed the amounts shown in the tables titled "Hydrostatic Test-C-900 PVC, Steel or Ductile Iron Water Mains" or "Hydrostatic Test-Concrete Cylinder Water Mains". Water lines of material in combination shall be tested for the type of pipe (material) with the least stringent hydraulic test pressure and maintained over a period of not less than four hours."

HYDROSTATIC TEST

C-900 OR 905 PVC, STEEL OR DUCTILE-IRON WATER MAINS

GALLONS ALLOWED									
L.F.	**Pipe Diameter**								
Pipe	**4"**	**6"**	**8"**	**10"**	**12"**	**14"**	**16"**	**18"**	**20"**
5	0.016	0.024	0.032	0.039	0.047	0.055	0.063	0.071	0.079
10	0.032	0.047	0.063	0.079	0.095	0.110	0.126	0.142	0.158
20	0.063	0.095	0.126	0.158	0.189	0.221	0.253	0.284	0.316'
30	0.095	0.142	0.189	0.237	0.284	0.331	0.379	0.426	0.473
40	0.126	0.189	0.253	0.316	0.379	0.442	0.505	0.568	0.631
50	0.158	0.239	0.316	0.395	0.473	0.552	0.631	0.710	0.789

60	0.189	0.284	0.379	0.473	0.568	0.663	0.758	0.852	0.947
70	0.221	0.331	0.442	0.552	0.663	0.773	0.884	0.994	1.105
80	0.253	0.379	0.505	0.631	0.756	0.884	1.010	1.136	1.263
90	0.284	0.426	0.568	0.710	0.852	0.994	1.136	1.278	1.420
100	0.316	0.473	0.631	0.789	0.947	1.105	1.263	1.420	1.578
200	0.631	0.947	1.263	1.578	1.894	2.210	2.525	2.841	3.157
300	0.947	1.420	1.894	2.367	2.841	3.314	3.788	4.261	4.735
400	1.263	1.894	2.525	3.157	3.788	4.419	5.051’	5.682	6.313
500	1.578	.2.367	3.157	3.946	4.735	5.524	6.313	7.102	7.891
600	1.894	2.841	3.788	4.735	5.682	6.629	7.576	8.523	9.470
700	2.210	3.314	4.419	5.524	6.629	7.734	8.838	9.943	11.048
800	2.525	3.788	5.051	6.313	7.576	8.838	10.101	11.364	12.626
900	2.841	4.261	5.682	7.102	8.523	9.943	11.364	12.784	14.205
1000	3.157	4.735	6.313	7.891	9.470	11.048	12.626	14.205	15.783

Maximum allowable water loss in 4 hours at 180 pounds per square inch of pressure for a rate of 25. gallons per inch diameter of pipe per mile over a 24-hour period

EQUATION THE ABOVE CHART IS BASED ON:

$$\text{Maximum Loss (Gal.)} = 25 \times \text{Diameter of Pipe in Inches} \times \frac{\text{L.F. of Pipe}}{5280} \times \frac{4}{24}$$

HYDROSTATIC TEST

CONCRETE CYLINDER WATER MAINS

GALLONS ALLOWED									
L.F.	Pipe Diameter								
Pipe	4"	6"	8"	10"	12"	14"	16"	18"	20"
5	0.031	0.047	0.063	0.078	0.095	0.110	0.126	0.142	0.158
10	0.063	0.095	0.126	0.158	0.189	.0.221	0.253	0:284	0.315
20	0.126	0.189	0.253	0.316	0.379	0.442	0.505	0.568	0.631
30	0.188	0.284	0.379	0.473	0.568	0.663	0.758	0.852	0.947
40	0.253	0.379	0.505	0.631	0.758	0.884	1.010	1.136	1.263
50	0.316	0.473	0.631	0.789	0.947	1.105	1.263	1.420	1.578
60	0.379	0.568	0.758	0.947	1.136	.1.326	1.515	1.704	1.894
70	0.442	0.663	0.884	1.105	1.326	1.547	1.768	1.989.	2.210
80	0.505	0.758	1.010	1.263.	1.515	1.768	2.020	2.273	2.525
90	0.568	0.852	1.136	1.420	1.704	1.989	2.273	2.557	2.841
100	0.631	0.947	1.263	1.578	1.894	2.209	2.525	2.841	3.156
200	1.263	1.894	2.525	3.156	3.788	4.419	5.050	5.682	6.313
300	1.894	2.841	3.788	4.735	5.682	6.628	7.575	8.522	9.470
400	2.525	3.788	5.050	6.313	7.575	8.838	10.100	11.363	12.626
500	3.158	4.735	6.313	7.891	9.470	11.047	12.626	14.204	15.782
600	3.788	5.682	7.575	9.469	11.363	13.257	15.151	17.045	18.938
700	4.419	6.628	8.838	11.047	13.257	15.468	17.676	19.885	22.095
800	5.050	7.575	10.100	12.626	15.152	17.676	20.201	22.726	25.251
900	5.682	8.522	11.363	14.204	17.044	19.886	22.726	25.567	28.405
1000	6.313	9.469	12.626	15.782	18.939	22.096	25.253	28.408	31.564

Maximum allowable water loss in 4 hours at 180 pounds per square inch of pressure for a rate of 50 gallons per inch diameter of pipe per mile over a 24-hour period

EQUATION THE ABOVE CHART IS BASED ON:

$$\text{Maximum Loss (Gal.)} = 50 \times \text{Diameter of Pipe in Inches} \times \frac{\text{L.F. of Pipe}}{5280} \times \frac{4}{24}$$

ITEM 506.7 Purging and Disinfection of Water Conduits (Add the following)

On all waterlines installed in the City of Anna the Contractor shall be responsible for Purging, Testing and Sterilization of the completed lines.

DIVISION 600 – CONDUIT AND APPURTENANCES REHABILITATION

DIVISION 700 – STRUCTURES

DIVISION 800 – MISCELLANEOUS CONSTRUCTION & MATERIALS

ITEM 801.3 RAILINGS

Reflectorized marking for guard rail and other traffic control used shall meet the requirements of 3M Scotchlite Brand Reflective Sheeting Grade, Series 2800, 3800 or 5800, or equal. The marking shall conform to U.S. Department of Transportation, Federal Highway Administration, STANDARD SPECIFICATIONS FOR CONSTRUCTION OF ROADS AND BRIDGES ON FEDERAL HIGHWAY PROJECTS, 1979 FP-79, Type III A, Sections 633.36 and 718.01 and Federal Supply Service, General Services Administration, LS-300 C, SHEETING AND TAPE REFLECTIVE NON-EXPOSED LENS, Reflectivity 2, Class 4.

ITEM 801.5 WIRE FENCING

801.5.2.1 Wire Fencing Fabric: All chain link fencing shall be No. 9 gage copper bearing open-hearth steel wire.

801.5.2.2 Posts

801.5.2.2.1 Metal: All posts shall be heavily galvanized by the hot-dip process after fabrication and shall be fitted with watertight malleable iron caps. All posts shall be of the following size and shape:

Line Posts: "H" Section hot rolled weighing not less than 4.10 pounds per linear foot or 3-1/2-inch O.D. pipe weighing not less than 3.65 pounds per linear foot.

Terminal Posts: Three inch (3") steel pipe weighing not less than 5.79 pounds per linear foot.

Gate Posts: Four inch (4") O.D. steel pipe weighing not less than 9.11 pounds per linear foot.

801.5.2.3 Rails. Gates. Braces and Fittings: Shall be 1-5/8 inch steel pipe weighing not less than 2.27 pounds per linear foot.

ITEM 803.2 GABION STRUCTURES

803.2.2 Materials

Add the sentence: All wire used, including tie and connecting wire, shall be certified by Mill Test Reports showing compliance with specification requirements.

803.2.2.2 Stone

Add the following: Facing stone shall be hand selected, large stone and shall be selected for best appearance. Facing stone shall be an off-white color and prior to laying the stone, samples shall be delivered' to the site and shall be approved 'by the Engineer for gradation and appearance.

ITEM 805 ELECTRICAL COMPONENTS AND CONDUIT

ITEM 805.3 MATERIAL (Add the following)

Pull Box. All pull boxes shall be Quazite precast polymer concrete, or approved equal. Boxes shall be approximately 17" x 30" x 30" and shall be furnished with a concrete cover.

Section 8.C. MODIFICATIONS TO STANDARD DRAWINGS

City of Anna Modifications to:
Standard Drawings of the Standard Specifications for Public Works Constructing
North Central Texas, 4th Edition, dated October 2004
(City's Revisions - August 2003)

DIVISION 4000 WATER DISTRIBUTION

Standard Drawing No. 4050 (Gate Valve 4" to 12" - Box and Extension Stem). Drawing shall be modified as follows:

1. Extension Stem to be two (2) feet below pavement surface, instead of one (1) foot.

Standard Drawing No. 4060A, 4060B, 4070A and 4070B (Vault Construction – Gate Valve 16" or Greater). Drawing shall be modified as follows:

1. Delete these details.
2. No gate valves on water lines sixteen (16) inches and larger, only butterfly valves.

Standard Drawing No. 4090 (Air Release Valve - Type "1"). Drawing shall be modified as follows:

1. Use SDR 9, no copper.
2. One (1) inch pipe, use CC thread.
3. Greater than one (1) inch pipe, use iron pipe thread.

Standard Drawing No. 4110 (Flush Point Installation - Type "1"). Drawing shall be modified as follows:

1. Service pipe to be SDR 9 (no copper).

Standard Drawing No. 4120 (Fire Hydrant Installation). Drawing shall be modified as follows:

1. All joints are to be restrained. Mega-lug or approved equal.

Standard Drawing No. 4130 (Water Service Installation ¾" or 1" Line). Drawing shall be modified as follows:

1. Service line shall be 3/4" I.D. C.T.S. Poly Tube SDR-9.
2. Tapping saddle shall be Clow F-6350 or approved equal.
3. Corporation stop shall be 3/4" Mueller Corporation Stop No. H-15008 or Hays equal.
4. 3/4" angle meter stop (meter nut x compression) shall be Mueller No. H-14253 with Mueller H-10889 or Hays equal.

5. Meter box shall be two (2) feet from back of curb or as directed by the City.
6. Meter boxes to be minimum Carson 1220, 12" x 20" Heavy Duty Plastic, with Meter lid or equivalent. Reader window shall be included with the meter lid.
7. Blue EMS disk shall be set at main line.
8. No C.F. Corporation stops.
9. See City detail for Service Meter Tail Connection.

Standard Drawing No. 4140 (Water Service Installation 1½" or 2" line). Drawing shall be modified as follows:

I. Service line shall be 2" I.D. C.T.S. poly tube SDR-9.
2. Tapping saddle shall be Clow F-6350 or approved equal.
3. Corporation stop shall be 2" Mueller Corporation Stop No. H-15008 or Hays equal.
4. Angle stop (compression x 2 bolt meter flange).
5. Meter box shall be two feet, six-inches (2' - 6") from back of curb or as directed by the City.
6. Meter boxes to be minimum Carson 1220, 12" x 20" Heavy Duty Plastic, with reader window within Meter lid or equivalent. (Note: May be required to be larger as determined by Water Department to allow full service access to meter.)
7. Blue EMS disk shall be set at main line.
8. See City detail for Service Meter Tail Connection.

Standard Drawing No. 4150 (4" Combined Service with 4" Meter). Drawing shall be modified as follows:

1. Install strainer between coupling adapter and meter.
2. Install testable double check valve after four (4) inch blind flange.

Standard Drawing No. 4160 (8" Detector Check — Service with 8" Meter). Drawing shall be modified as follows:

1. Install gate valves each side of check valve.
2. Install double check valve after 8" x 12" nipple.
3. Install strainer between coupling adapter and meter.

Standard Drawing No. 4170 (8" Fire Line Standpipe — Service with 8" Meter). Drawing shall be modified as follows:

I. Install gate valve before eight (8) inch coupling adapter.
2. Install double check valve after eight (8) inch blind flange.

Standard Drawing No. 4180 (4" Domestic Service with 3" Meter). Drawing shall be modified as follows:

1. Strainer shall be installed after reducer coupling adapter.

2. Double check valve shall be installed after 4” x 3” reducer.
3. Ductile iron should be used for all material.

Standard Drawing No. 4190A (Large Service Meter Vault Installation). Drawing shall be modified as follows:

I. Gate valves shall be installed on each side of meter.
2. Strainer shall be installed before meter.
3. Double check valve shall be installed after meter.
4. Install by-pass line with valve.

Standard Drawing No. 4200 (Water Main Lowering Below Wastewater Main). Drawing shall be modified as follows:

I. Wastewater main shall be pressure pipe, extending 9’ minimum from the crossing.
2. Deflect water line when possible.

DIVISION 5000 WASTEWATER COLLECTION

Standard Drawing No. 5010 (Wastewater Main Tie-In at Cleanout or M.H. Stubout). Drawing shall be modified as follows:

I. “C — T” pipe adapter shall be non-shear.

Standard Drawing Nos. 5020, 5030, 5050, 5060 and 5080 (Wastewater Manholes). Drawing shall be modified as follows:

1. Install green EMS disks at all manholes.

Standard Drawing No. 5020 (Wastewater Manhole — Pre-cast). Drawing shall be modified as follows:

I. Lip to be pre-cast.

Standard Drawing No. 5040 (Wastewater Manhole — Fiberglass). Drawing shall be modified as follows:

1. Delete this detail.

Standard Drawing No. 5070 (Wastewater Manhole — Outside Drop Connection). Drawing shall be modified as follows:

1. Delete this detail.

Standard Drawing No. 5110 (Wastewater Main- Cleanout). Drawing shall be modified as follows:

1. PVC pipe only. No clay pipe.

Standard Drawing No. 51.20 (Wastewater Services With and Without Cleanout). Drawing shall be modified as follows:

1. Replace with City Detail.
2. Cleanout shall be cast iron sewer cleanout, Type Trinity Valley, Pattern 1684 or approved equal.
3. If cleanout is installed in roadway or parking area then traffic cleanout shall be designed to handle traffic loads.

Standard Drawing No. 5130 (Wastewater Services- In Earth and In Rock). Drawing shall be modified as follows:

1. Delete this detail.

Standard Drawing No. 5150 (Wastewater Service Stub Out in Advance of Paving). Drawing shall be modified as follows:

I. Install green EMS disk at end of service.

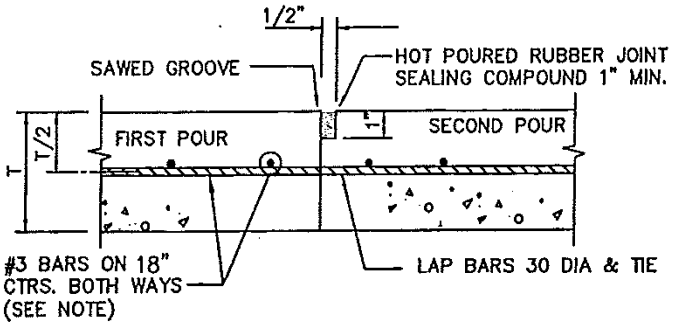
Standard Drawing No. 5160 (Wastewater Service Replacement in Advance of Paving). Drawing shall be modified as follows:

1. Install green EMS disk at property line.
2. Wyes only, no tees.

Section 8.D. ADDITIONAL STANDARD DRAWINGS

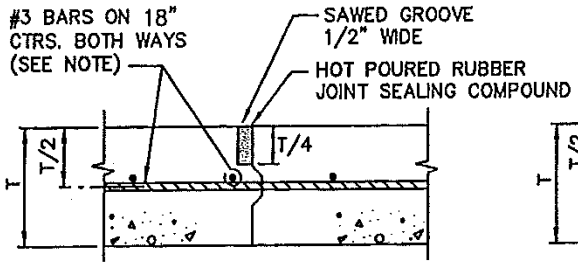
CITY OF ANNA, TEXAS

ADDITIONAL STANDARD DRAWINGS (Note: In the event of any conflicts, the standard drawings that follow in this Section 8.D. shall govern.)



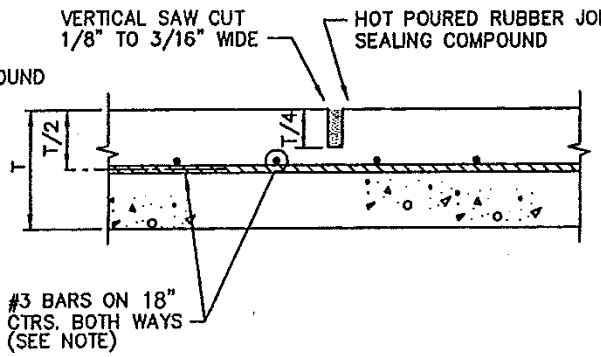
CONSTRUCTION JOINT

N.T.S.



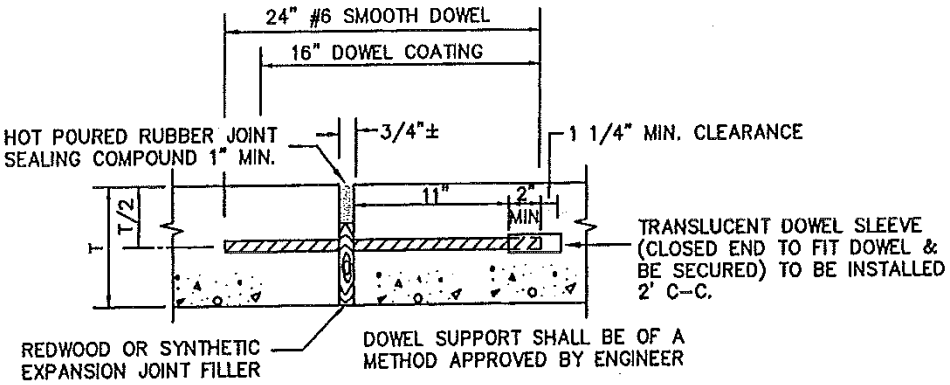
KEYWAY JOINT

(FOR PAVEMENT THICKNESS > 6")
N.T.S.



SAWED CONTRACTION JOINT

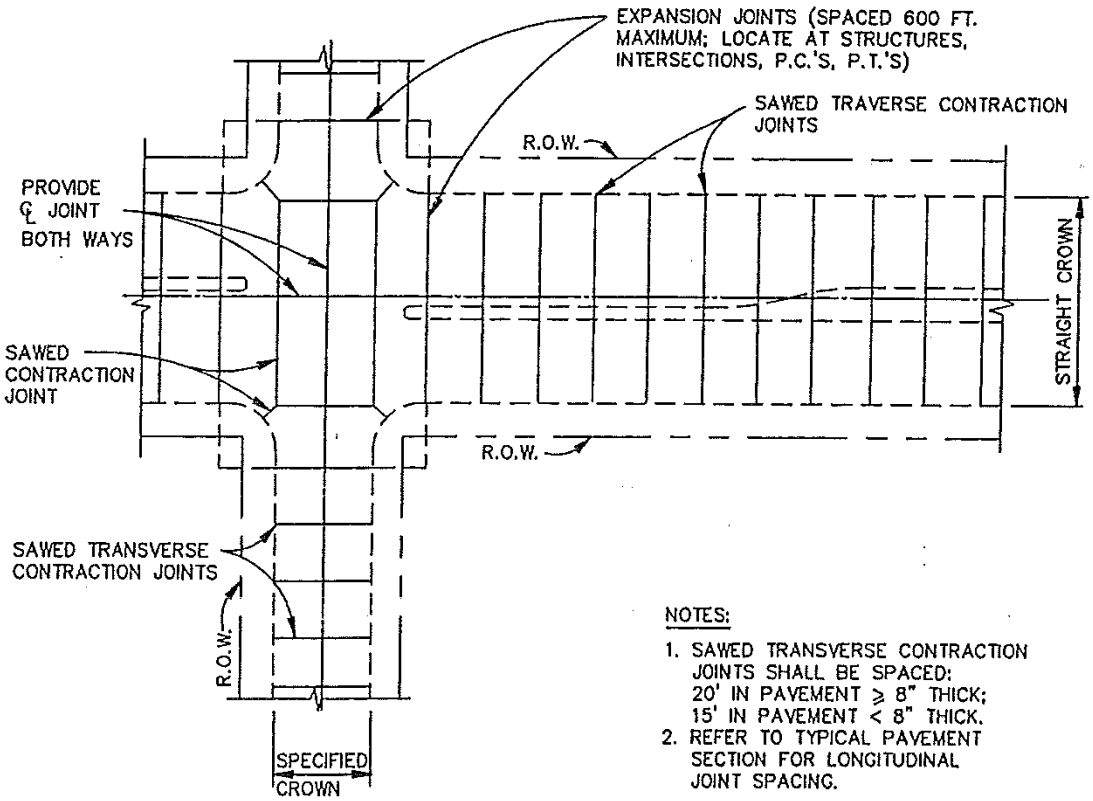
N.T.S.



EXPANSION JOINT

(SPACED 600 FT. MAXIMUM; LOCATE AT
STRUCTURES AND AT INTERSECTION P.C.'S & P.T.'S)
N.T.S.

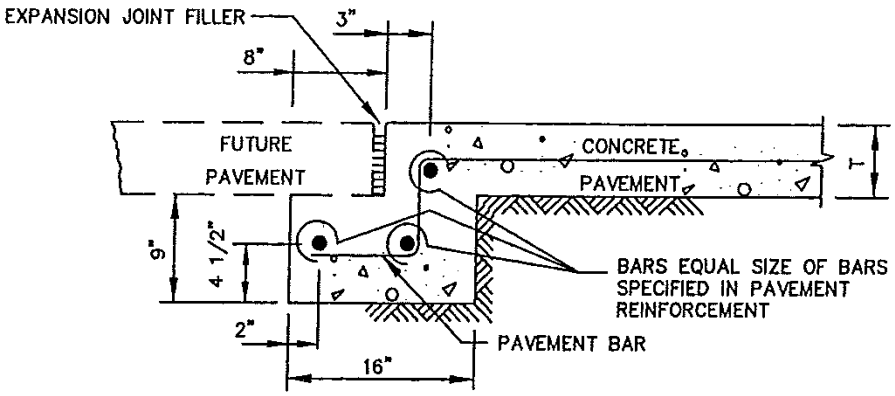
Reinforced Concrete Pavement	CITY OF ANNA, TEXAS	Revision Date	Scale
			None
Joints		Date	Sheet No.
		Dec,2012	PAV-01



SPACING DIAGRAM FOR TRANSVERSE JOINTS

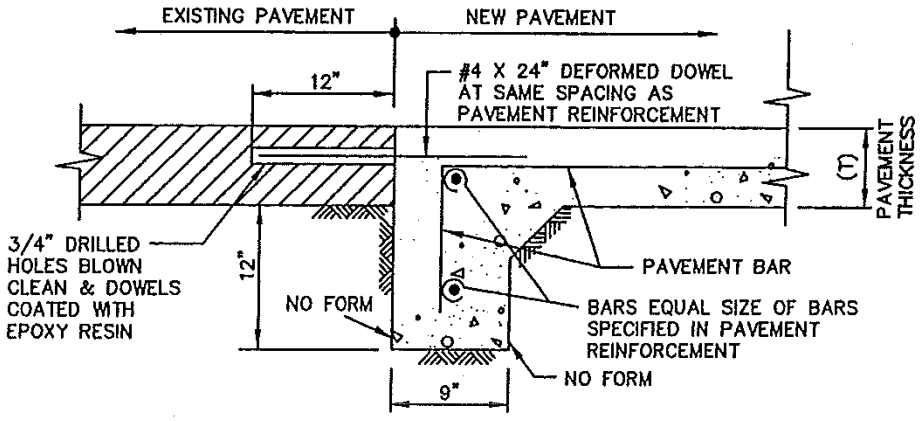
N.T.S.

Reinforced Concrete Pavement	CITY OF ANNA, TEXAS	Revision Date	Scale
			None
Transverse Joint Spacing		Date	Sheet No.
		Dec,2012	PAV–02



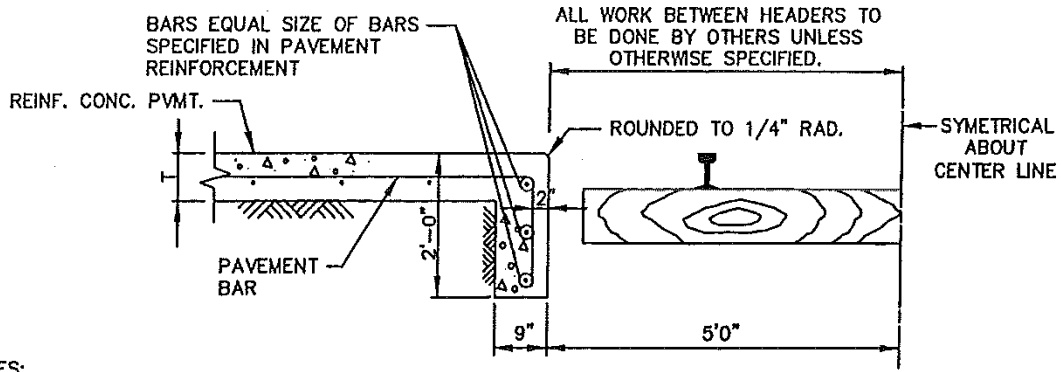
STREET HEADER FOR FUTURE PAVEMENT

N.T.S.



STREET HEADER AT EXISTING PAVEMENT

N.T.S.



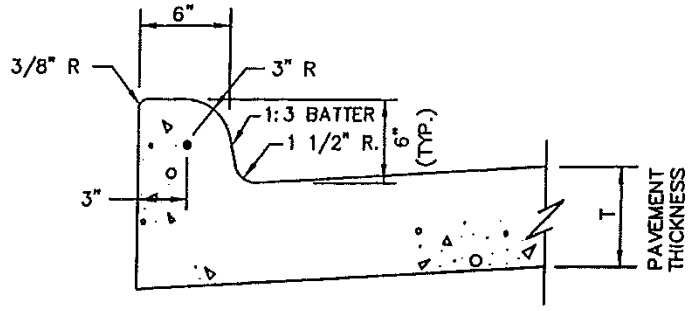
NOTES:

1. PAVEMENT BARS TO BE BENT DOWN INTO HEADER.
2. HEADER AND PAVEMENT TO BE MONOLITHIC.

STREET HEADER AT RAILROAD

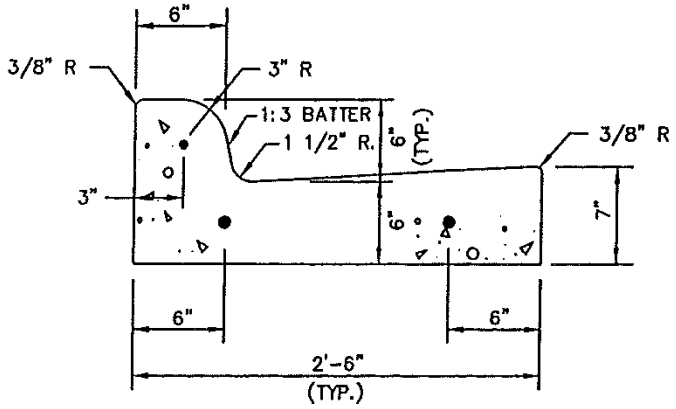
N.T.S.

Reinforced Concrete Pavement	CITY OF ANNA, TEXAS	Revision Date	Scale
			None
Street Headers		Date	Sheet No.
		Dec,2012	PAV–03



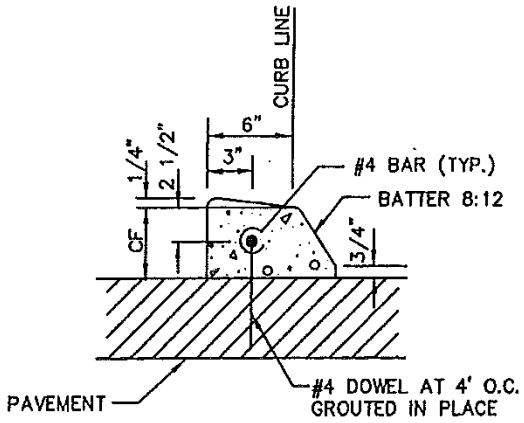
INTEGRAL CURB & GUTTER

N.T.S.



SEPARATE CURB & GUTTER

N.T.S.



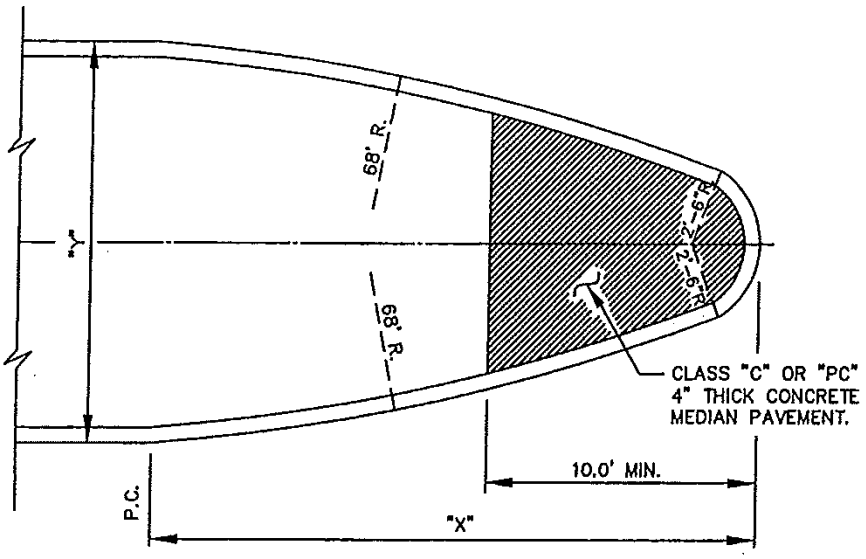
DOWELED CURB

N.T.S.

NOTES:

1. REINFORCEMENT SHALL BE NO. 4 BARS, UNLESS OTHERWISE SPECIFIED.
2. CONCRETE SHALL BE CLASS "C" OR "PC".
3. "CF" IS 6" UNLESS OTHERWISE SPECIFIED.
4. ALL CURBS ARE CONSTRUCTED OF PORTLAND CEMENT CONCRETE UNLESS OTHERWISE SHOWN.
5. GRADE SHALL BE MEASURED AT BACK OF CURB.

Concrete Curbs & Curb W/Gutter Integral, Separate & Doweled	CITY OF ANNA, TEXAS Anna	Revision Date	Scale None
		Date Dec,2012	Sheet No. PAV–04



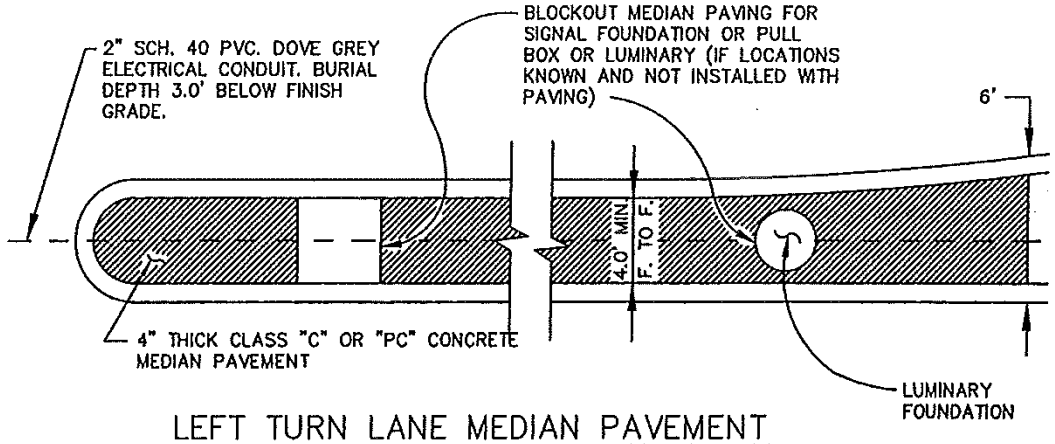
DIMENSIONS OF MEDIAN NOSE

Y = 15'	X = 27.6'
Y = 16'	X = 28.8'
Y = 17'	X = 29.9'
Y = 18'	X = 30.9'

CONCRETE NOSE FOR MEDIAN ISLAND

N.T.S.

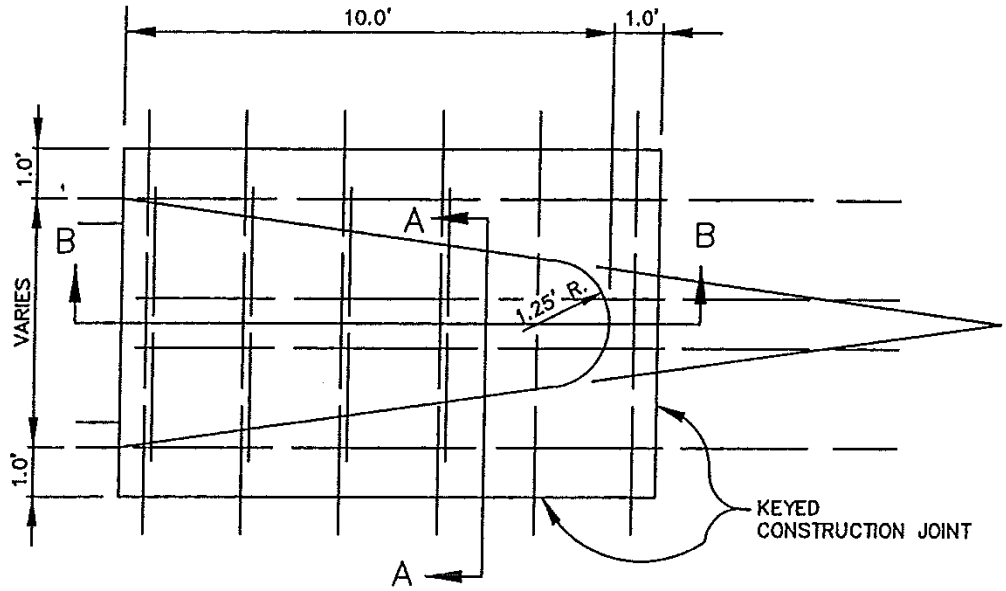
NOTE:
MEDIAN PAVING SHALL EXTEND TO POINT WHERE MEDIAN IS 6' WIDE. IF MEDIAN IS 6' WIDE, PAVING SHALL EXTEND 15' FROM NOSE. FOR MEDIANS WIDER THAN 6' PAVING SHALL EXTEND 10' FROM NOSE. ALL DISTANCES ARE MINIMUM.



LEFT TURN LANE MEDIAN PAVEMENT

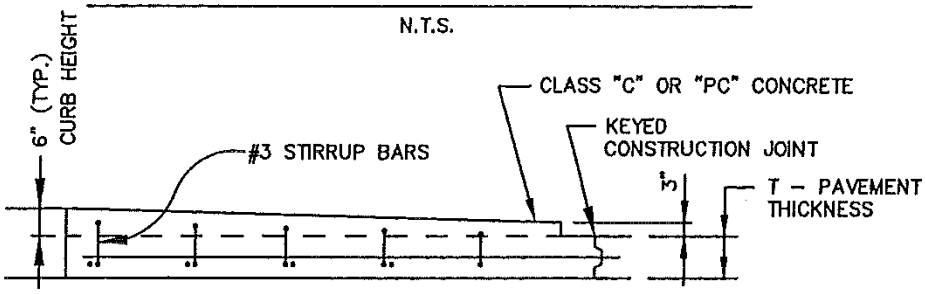
N.T.S.

Median Island Pavement Nose & Left Turn Lane	CITY OF ANNA, TEXAS Anna	Revision Date Date Dec,2012	Scale None Sheet No. PAV–05



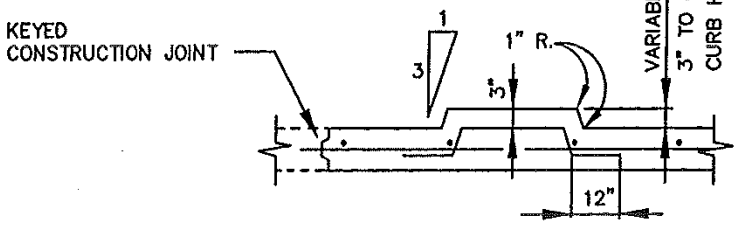
MONOLITHIC CONCRETE MEDIAN NOSE

N.T.S.



SECTION B–B

N.T.S.

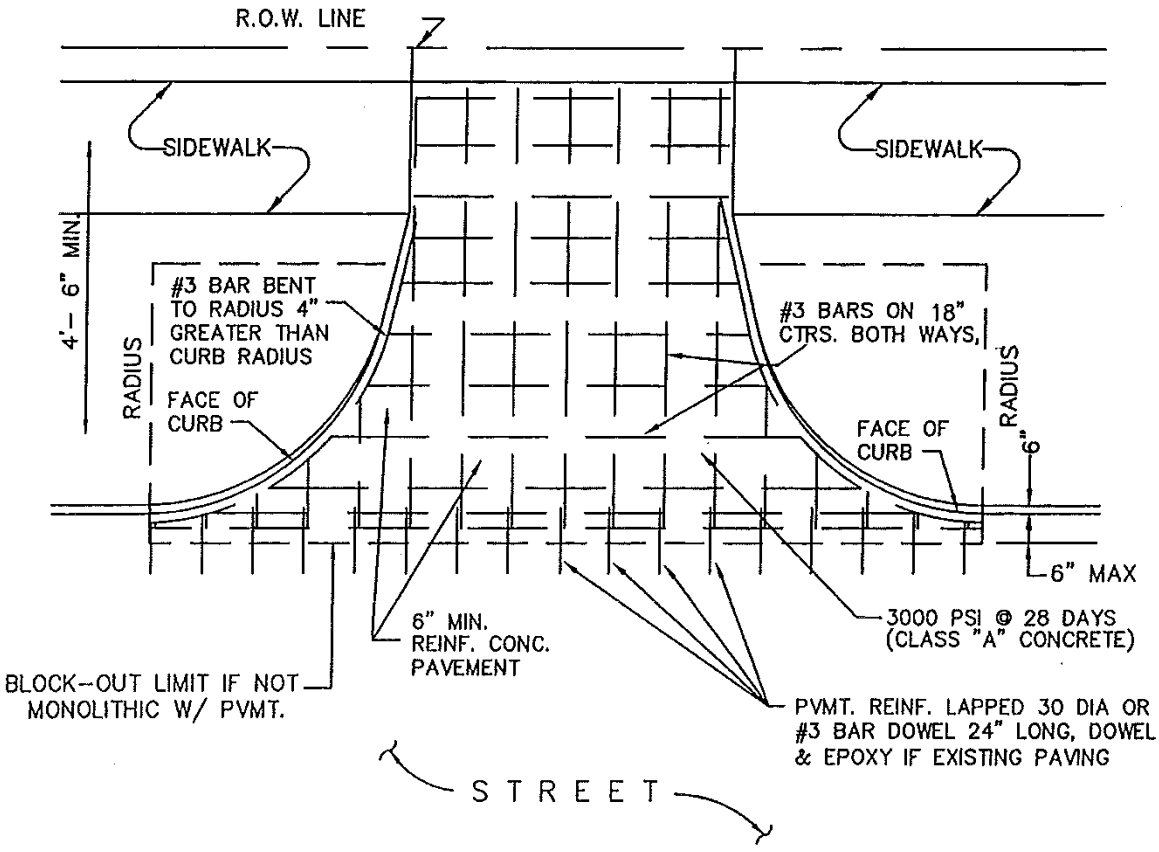


SECTION A–A

N.T.S.

NOTE:
REINFORCEMENT BARS SHALL MATCH THOSE IN PAVEMENT.

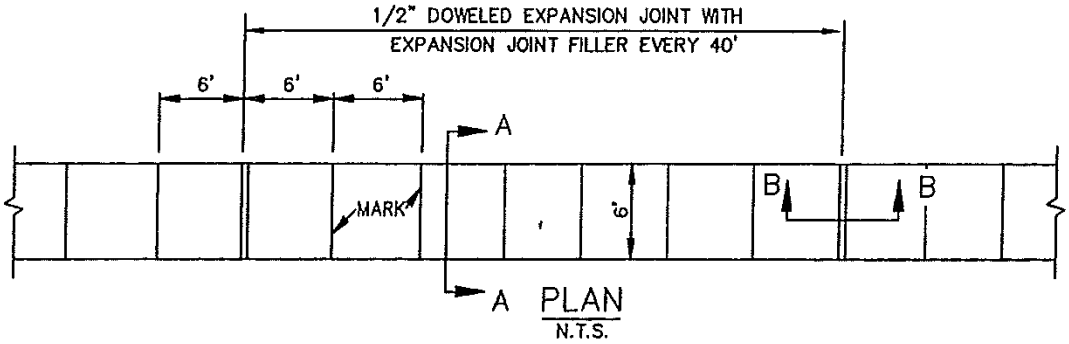
Median Island Pavement	CITY OF ANNA, TEXAS	Revision Date	Scale
			None
Monolithic Concrete Nose		Date	Sheet No.
		Dec,2012	PAV–06

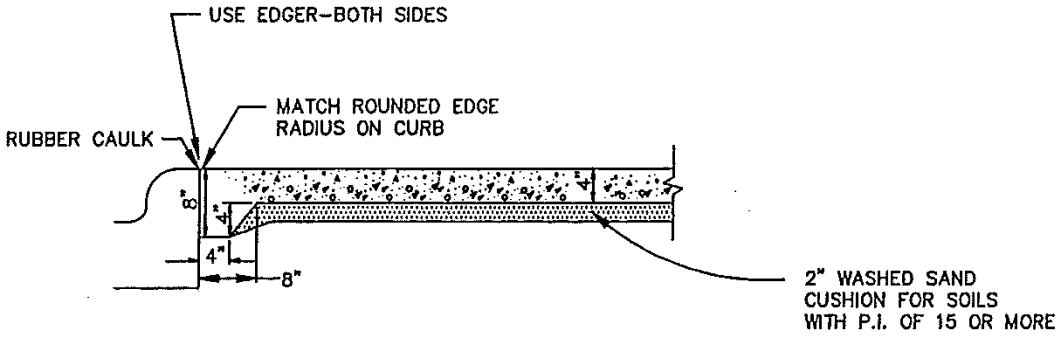


PLAN VIEW

N.T.S.

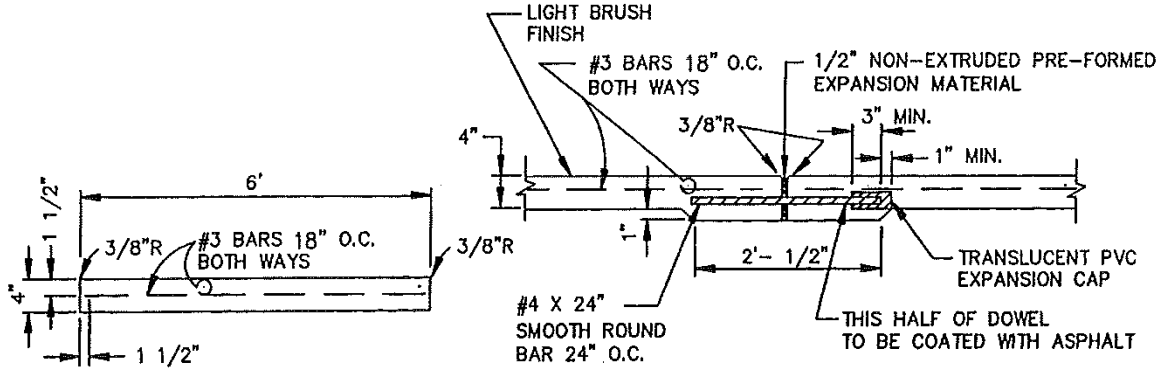
Concrete Driveway Approach Radius Return	CITY OF ANNA, TEXAS Anna	Revision Date	Scale None
		Date Dec,2012	Sheet No. PAV-07





JOINT LUG DETAIL FOR MEDIAN PAVEMENT OR SIDEWALK ADJACENT TO CURB

N.T.S.



SECTION "A-A"
N.T.S.

SECTION "B-B"
N.T.S.

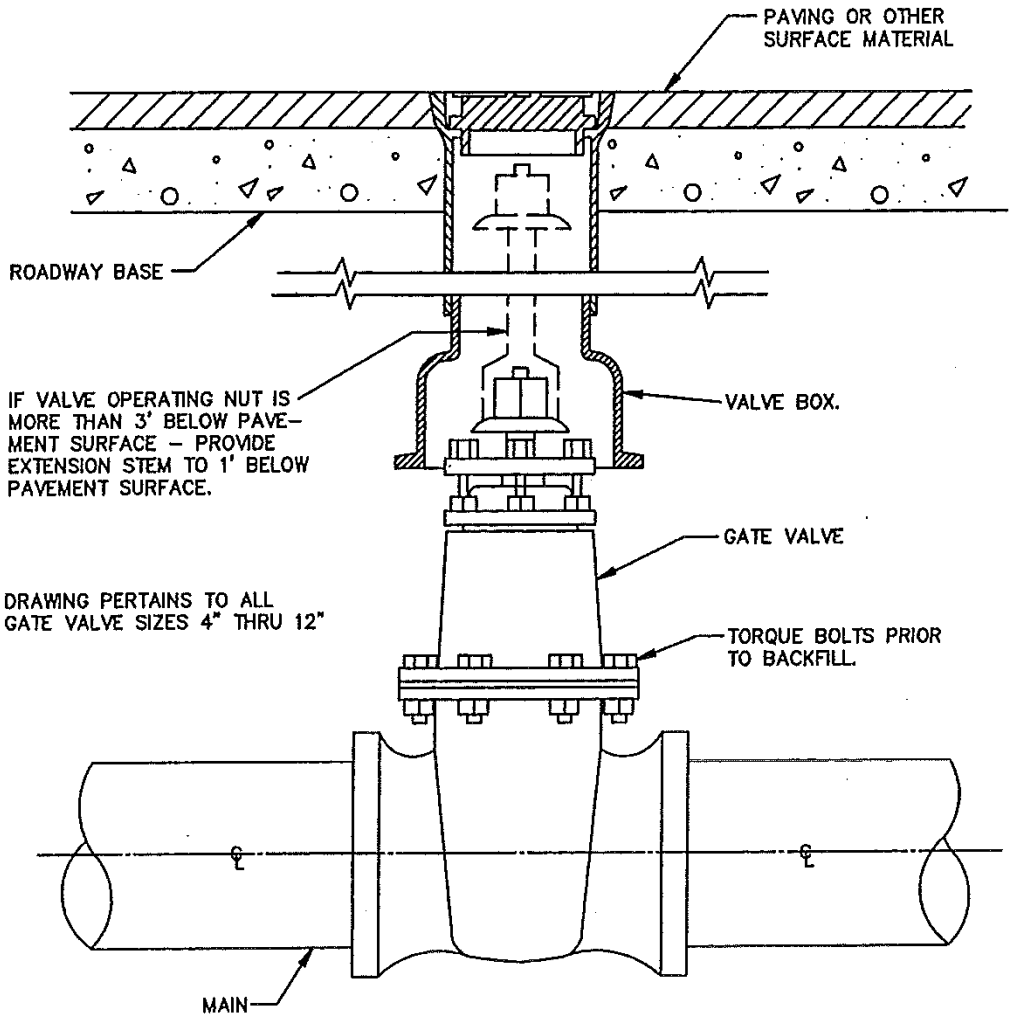
NOTE:

1. REFER TO STANDARD SPECIFICATION ITEM 305.2 FOR ALTERNATE REINFORCEMENT.
2. CROSS SLOPE OF SIDEWALK SHALL BE ± 1/4" PER FT. MIN. TO ± 3/8" PER FT. MAX.
3. OTHER THAN 6'-0" SIDEWALK WIDTH MAY BE SPECIFIED BY OWNER.
4. SIDEWALK SHALL BE CLASS "A" CONCRETE UNLESS OTHERWISE SPECIFIED BY OWNER.
5. ALL HONEYCOMB IN BACK OF CURB TO BE TROWEL-PLASTERED BEFORE POURING SIDEWALK.
6. LUG MAY BE FORMED BY SHAPING SUBGRADE TO APPROXIMATE DIMENSIONS SHOWN.

Reinforced Concrete Sidewalk	CITY OF ANNA, TEXAS	Revision Date	Scale
			None
Joints And Spacing		Date	Sheet No.
		Dec,2012	PAV-08

NOTE:

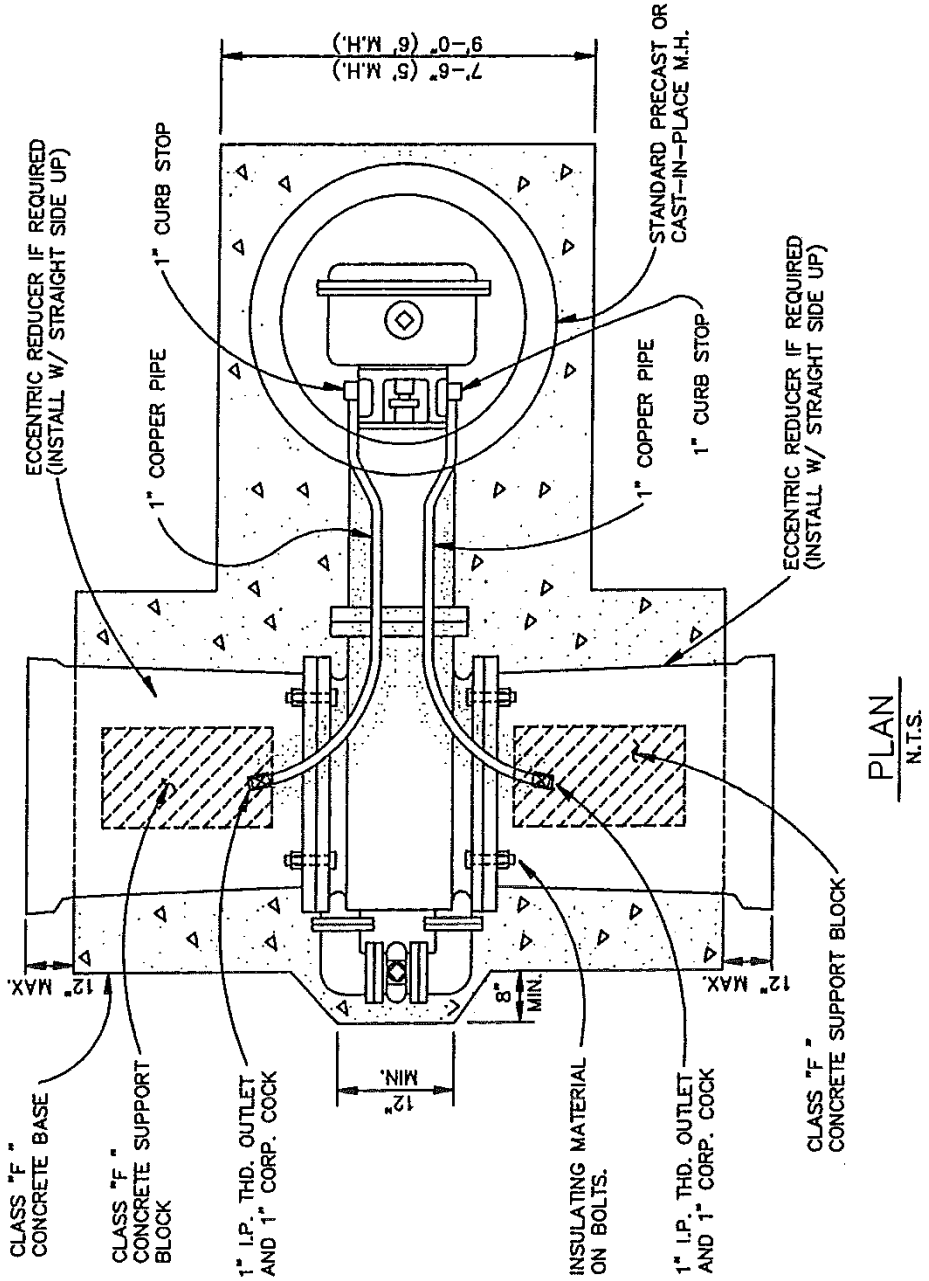
IN UNPAVED AREAS, INSTALL 2' x 2' x 6" CONCRETE VALVE PAD FLUSH WITH THE TOP OF VALVE BOX. REINFORCE WITH #3 BARS ON 6" CENTERS BOTH WAYS.



GATE VALVE BOX AND EXTENSION STEM

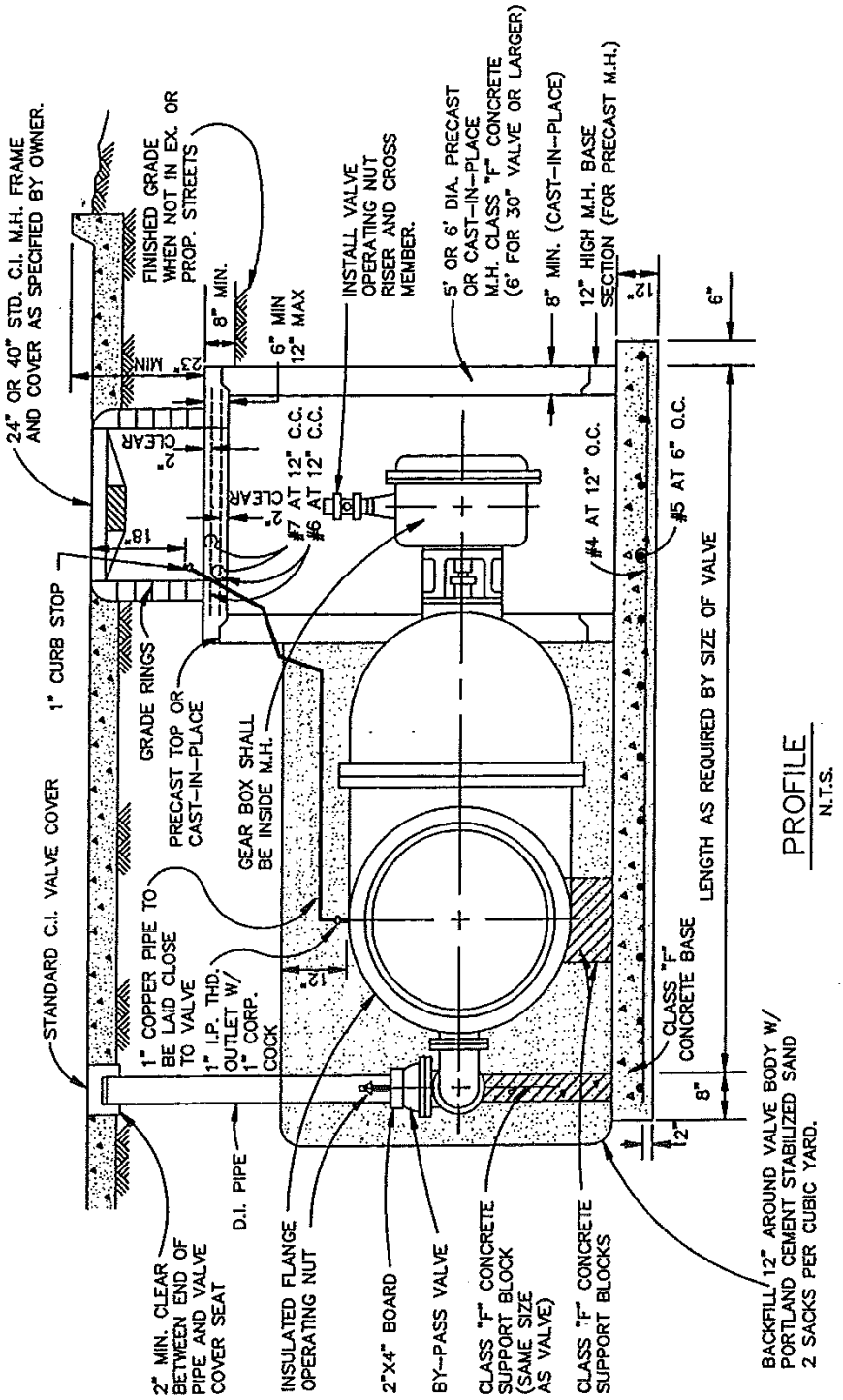
N.T.S.

Gate Valve 4" To 12"	CITY OF ANNA, TEXAS	Revision Date	Scale
			None
Box & Extension Stem		Date	Sheet No.
		Dec,2012	WAT–01

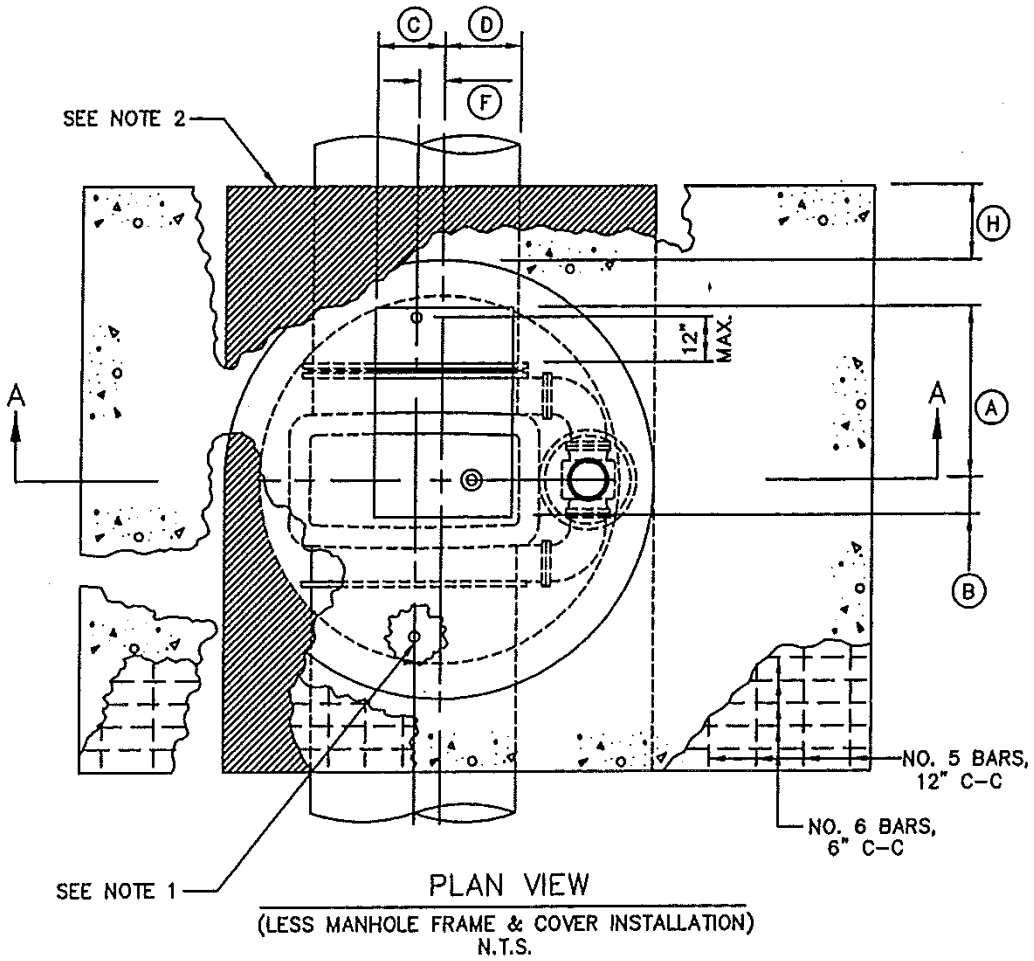


PLAN
N.T.S.

Vault Construction Plan Horizontal Gate Valve ≧ 16"	CITY OF ANNA, TEXAS ★ Anna	Revision Date Date Dec,2012	Scale None Sheet No. WAT–02



Vault Construction Profile Horizontal Gate Valve ≥ 16"	CITY OF ANNA, TEXAS ★ Anna	Revision Date Date Dec,2012	Scale None Sheet No. WAT–03



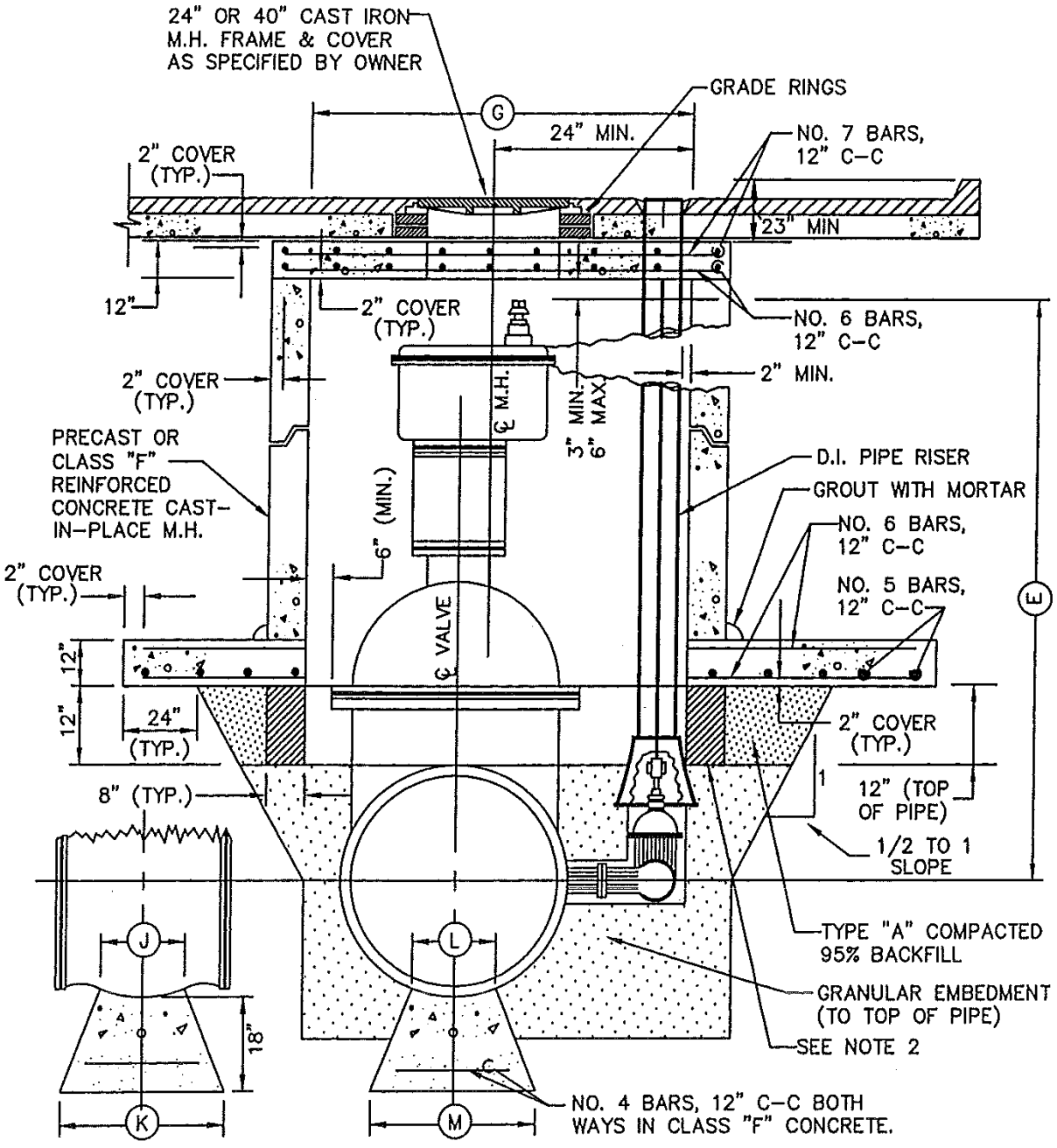
PLAN VIEW

(LESS MANHOLE FRAME & COVER INSTALLATION)
N.T.S.

GATE VALVE SIZE	DIMENSION TABLE											
	A	B	C	D	E	F	G	H	J	K	L	M
16"	20"	20"	12"	12"	44 1/2"	1"	48"	12"	10"	24"	12"	16"
18"	20"	20"	12"	12"	51 3/8"	2"	48"	12"	12"	24"	12"	18"
20"	22"	18"	12"	12"	56 5/8"	1"	54"	12"	12"	24"	16"	20"
24"	26"	14"	12"	12"	64 3/8"	1"	60"	18"	14"	30"	18"	24"
30"	28"	12"	12"	12"	80 5/8"	3"	66"	18"	18"	30"	20"	30"
36"	32"	8"	12"	12"	90 1/16"	4"	72"	18"	18"	36"	24"	36"
42"	34"	6"	15"	9"	107 3/4"	5"	78"	24"	20"	36"	30"	42"
48"	36"	4"	14"	10"	121 5/8"	4"	90"	24"	26"	42"	36"	48"
54"	36"	4"	9"	15"	142 1/2"	3"	102"	24"	32"	46"	40"	54"

NOTES:
1. PROVIDE CORPORATION AND CURB STOPS A MAXIMUM OF 12" FROM EACH END OF GATE VALVE, AS SHOWN. CORPORATION AND CURB STOP SIZES SHALL BE 1" FOR 16", 20", AND 24" NOMINAL PIPE DIAMETERS; 2" FOR 30" AND LARGER DIAMETERS. 2" TAPS SHALL BE MADE AS A 2" FLANGED OUTLET WITH INSULATED ADAPTOR KIT. COPPER RISERS SHALL BE PROVIDED BETWEEN THE CORPORATION AND CURB STOPS. CURB STOPS SHALL BE INSTALLED AT AN ELEVATION 12" ABOVE THE TOP SURFACE OF VAULT BOTTOM SLAB.
2. POLYURETHANE CUSHION PAD.

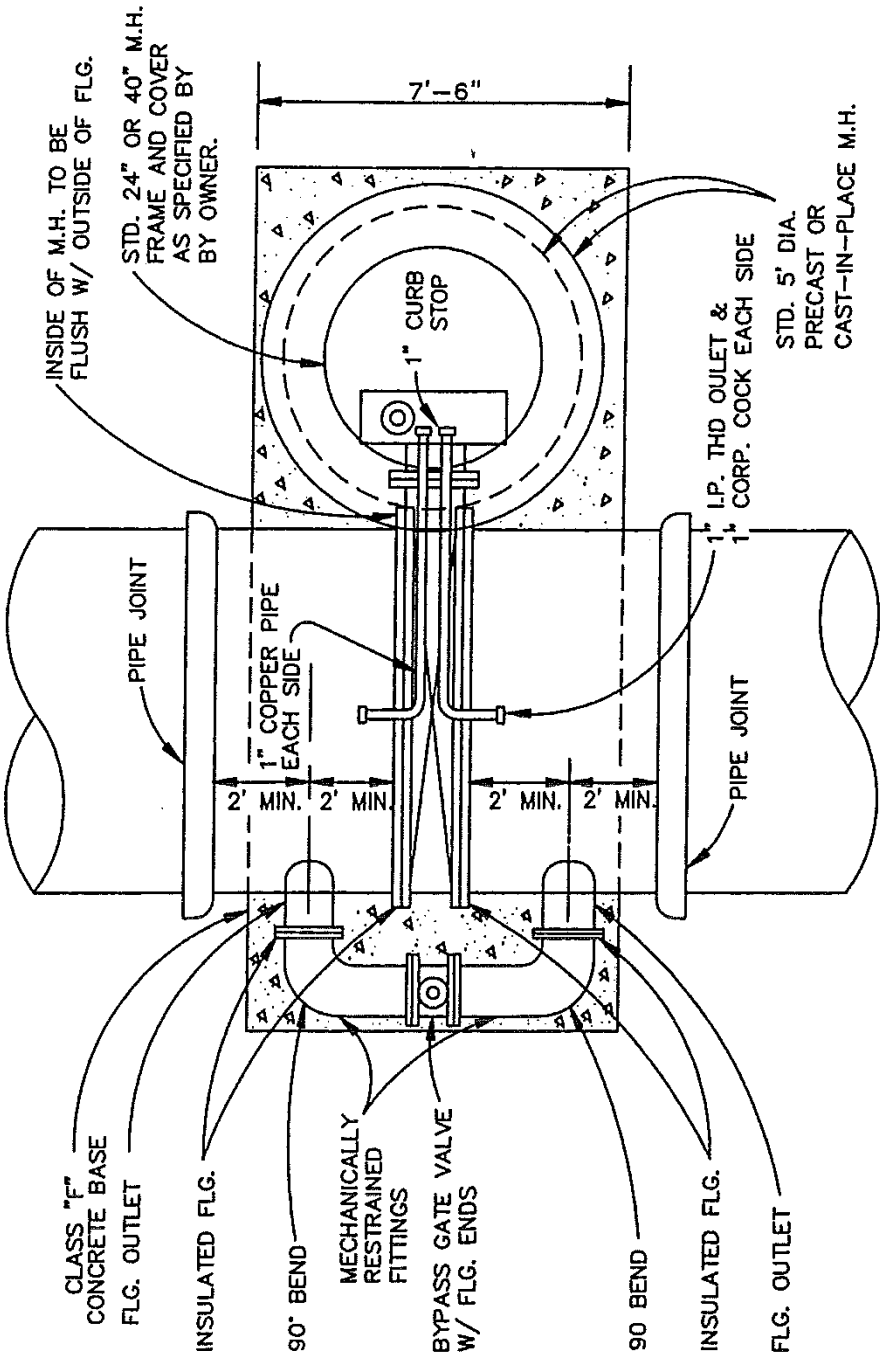
Vault Construction Dimensions Vertical Gate Valve ≧ 16"	CITY OF ANNA, TEXAS ★ Anna	Revision Date	Scale None
		Date Dec,2012	Sheet No. WAT-04



SECTION "A-A"

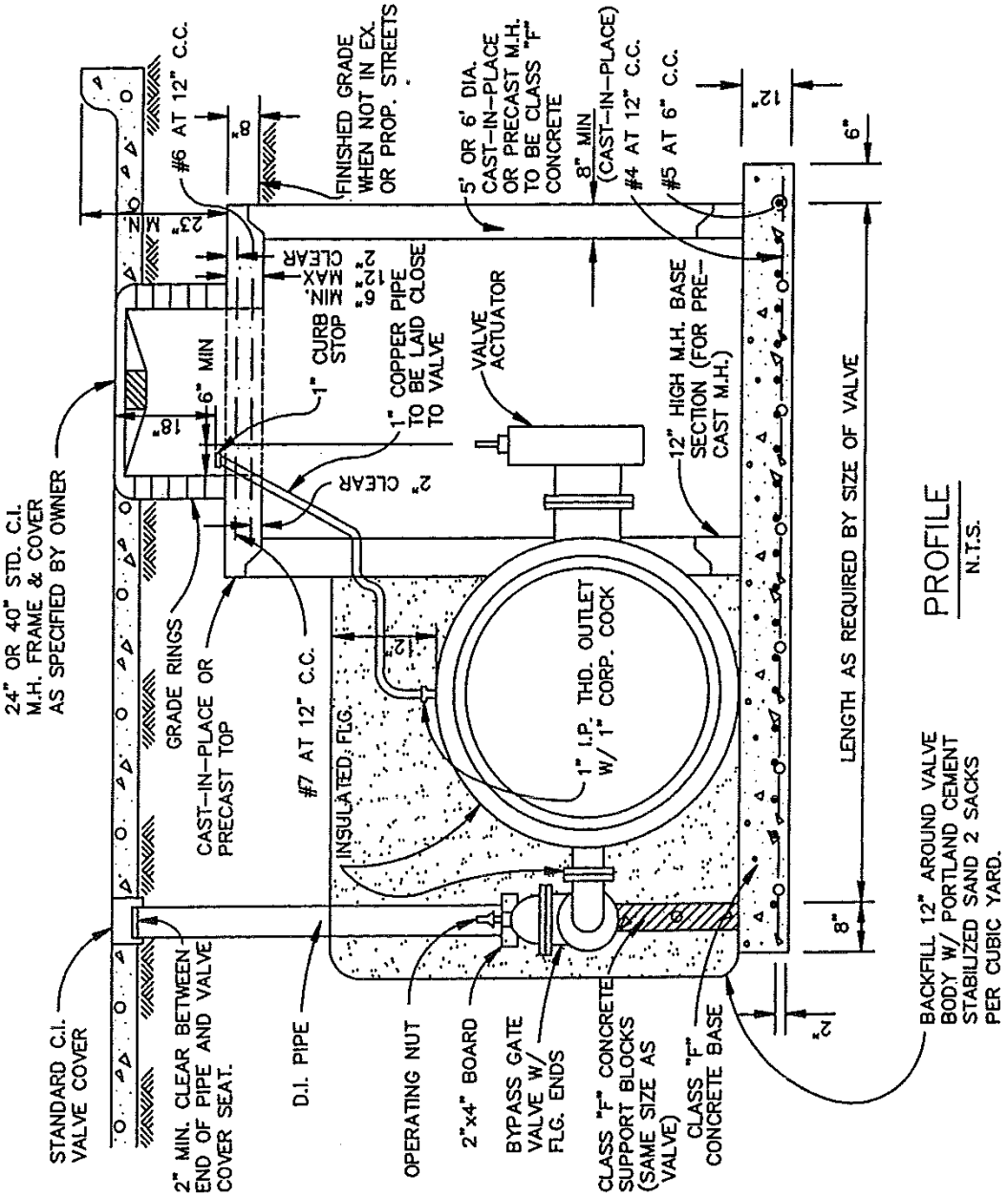
REFER TO STD. DWG. 4070A FOR DIMENSION TABLE AND GENERAL NOTES.

Vault Construction Section Vertical Gate Valve ≧ 16"	CITY OF ANNA, TEXAS ★ Anna	Revision Date	Scale None
		Date Dec,2012	Sheet No. WAT-05

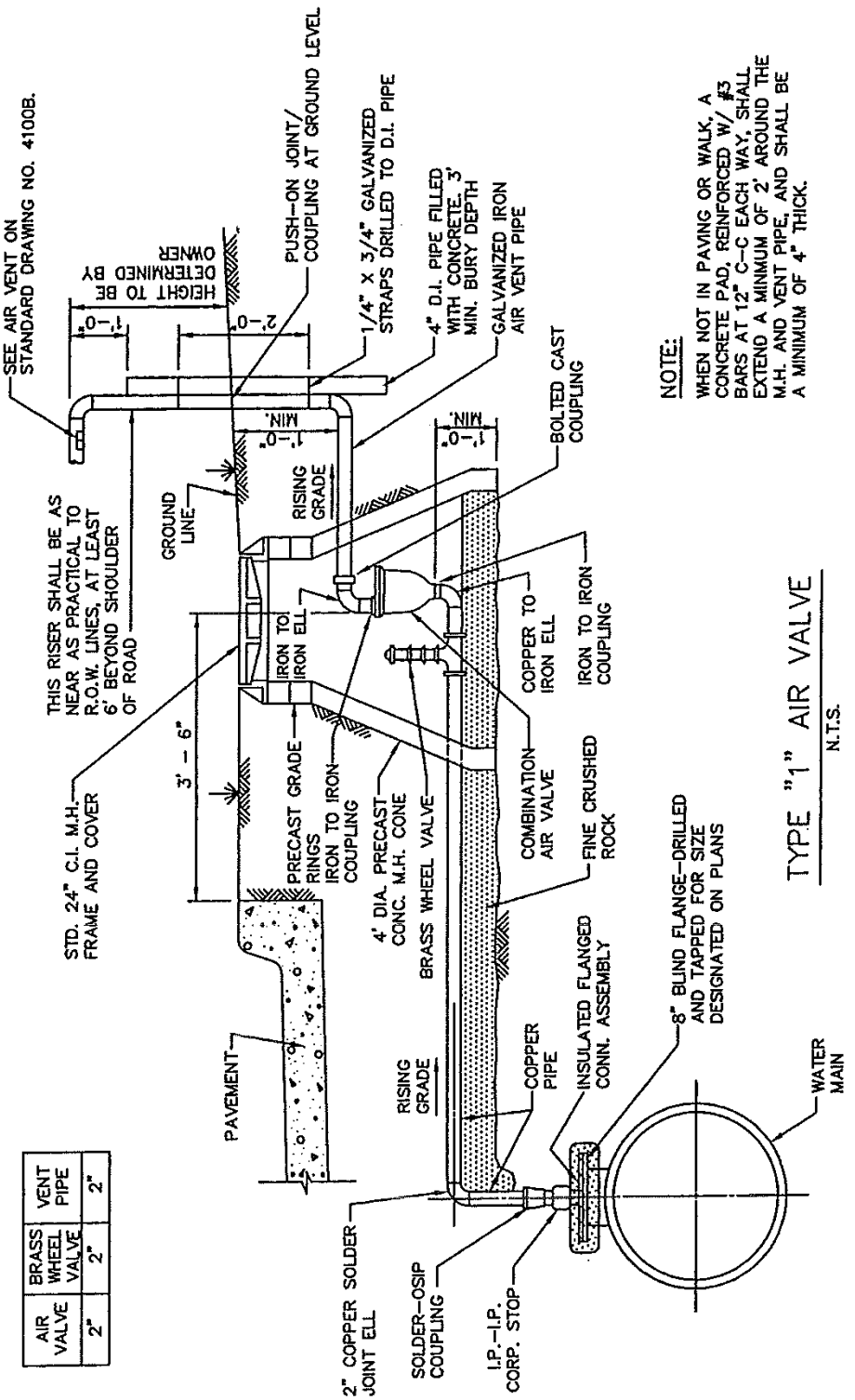


PLAN
N.T.S.

Vault Construction Plan	CITY OF ANNA, TEXAS	Revision Date	Scale
Butterfly Valve ≥ 16"		Date	Sheet No.
		Dec,2012	WAT–06



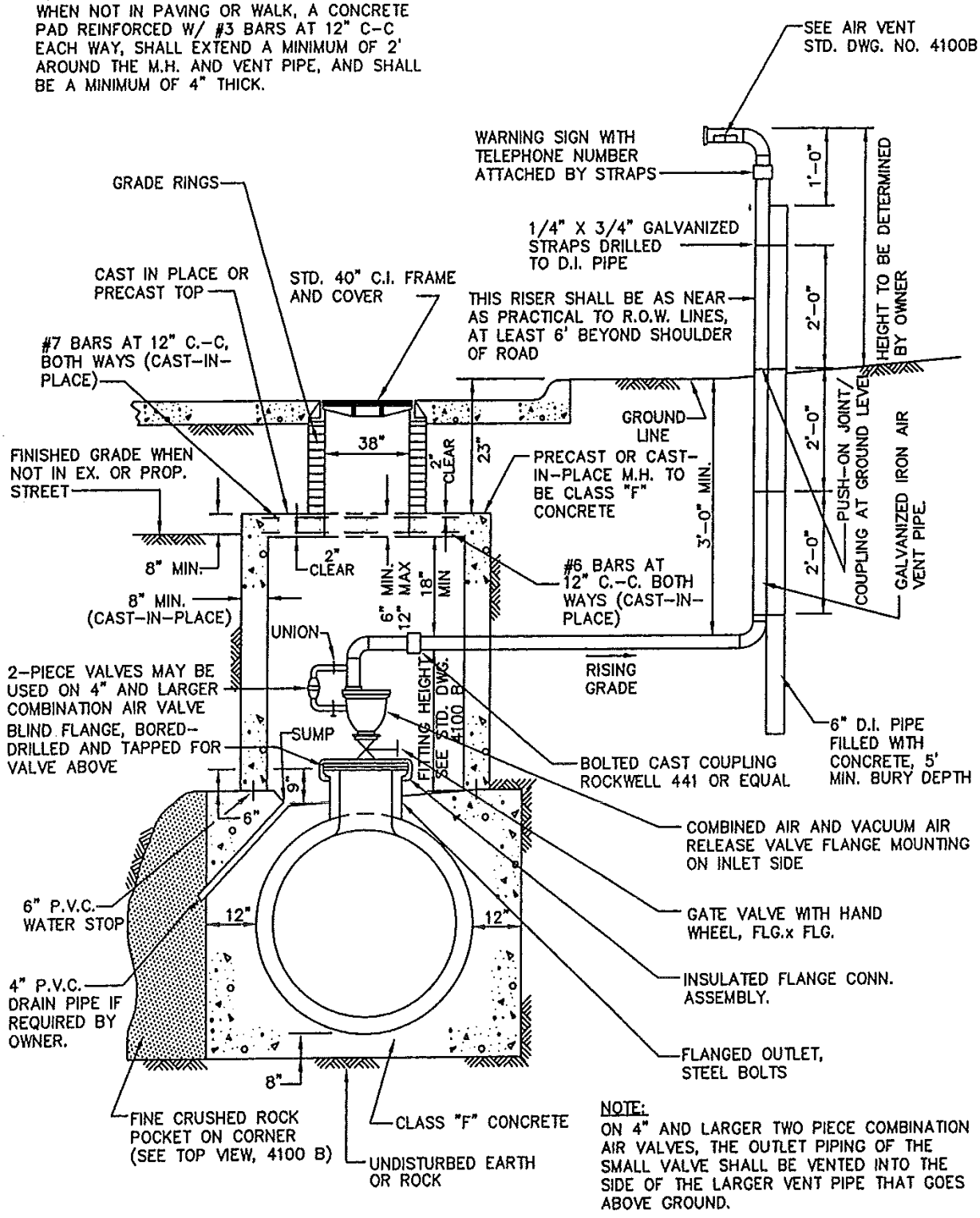
Vault Construction Profile	CITY OF ANNA, TEXAS	Revision Date	Scale
Butterfly Valve ≧ 16"			None
		Date	Sheet No.
		Dec,2012	WAT–07



AIR VALVE	BRASS WHEEL VALVE	VENT PIPE
2"	2"	2"

Combination Air Vacuum Valve Type "1"	CITY OF ANNA, TEXAS	Revision Date	Scale None
		Date Dec,2012	Sheet No. WAT–08

NOTE:
WHEN NOT IN PAVING OR WALK, A CONCRETE PAD REINFORCED W/ #3 BARS AT 12" C-C EACH WAY, SHALL EXTEND A MINIMUM OF 2' AROUND THE M.H. AND VENT PIPE, AND SHALL BE A MINIMUM OF 4" THICK.

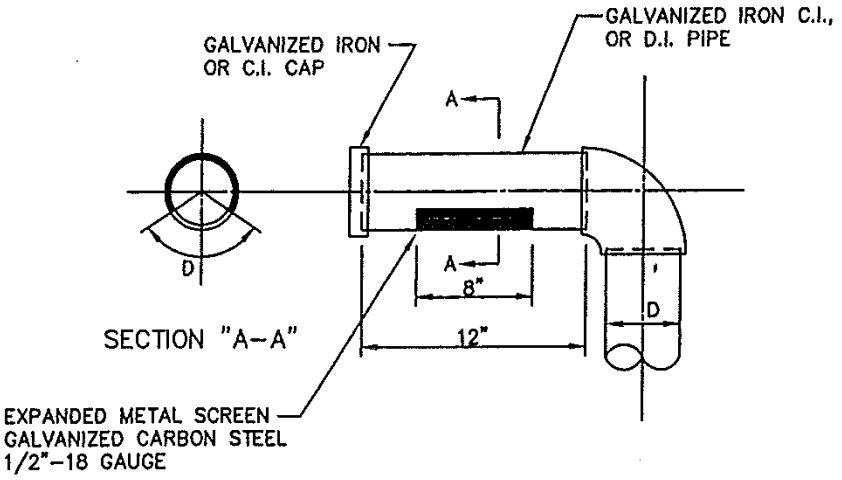


NOTE:
ON 4" AND LARGER TWO PIECE COMBINATION AIR VALVES, THE OUTLET PIPING OF THE SMALL VALVE SHALL BE VENTED INTO THE SIDE OF THE LARGER VENT PIPE THAT GOES ABOVE GROUND.

TYPE "2" AIR VALVE

N.T.S.

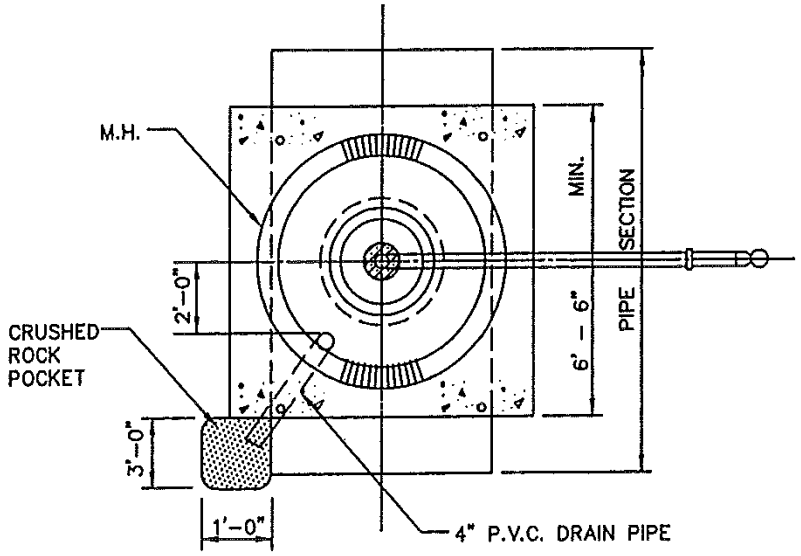
Combination Air Vacuum Valve Type "2" Section	CITY OF ANNA, TEXAS Anna	Revision Date Date Dec,2012	Scale None Sheet No. WAT-09



AIR VENT

N.T.S.

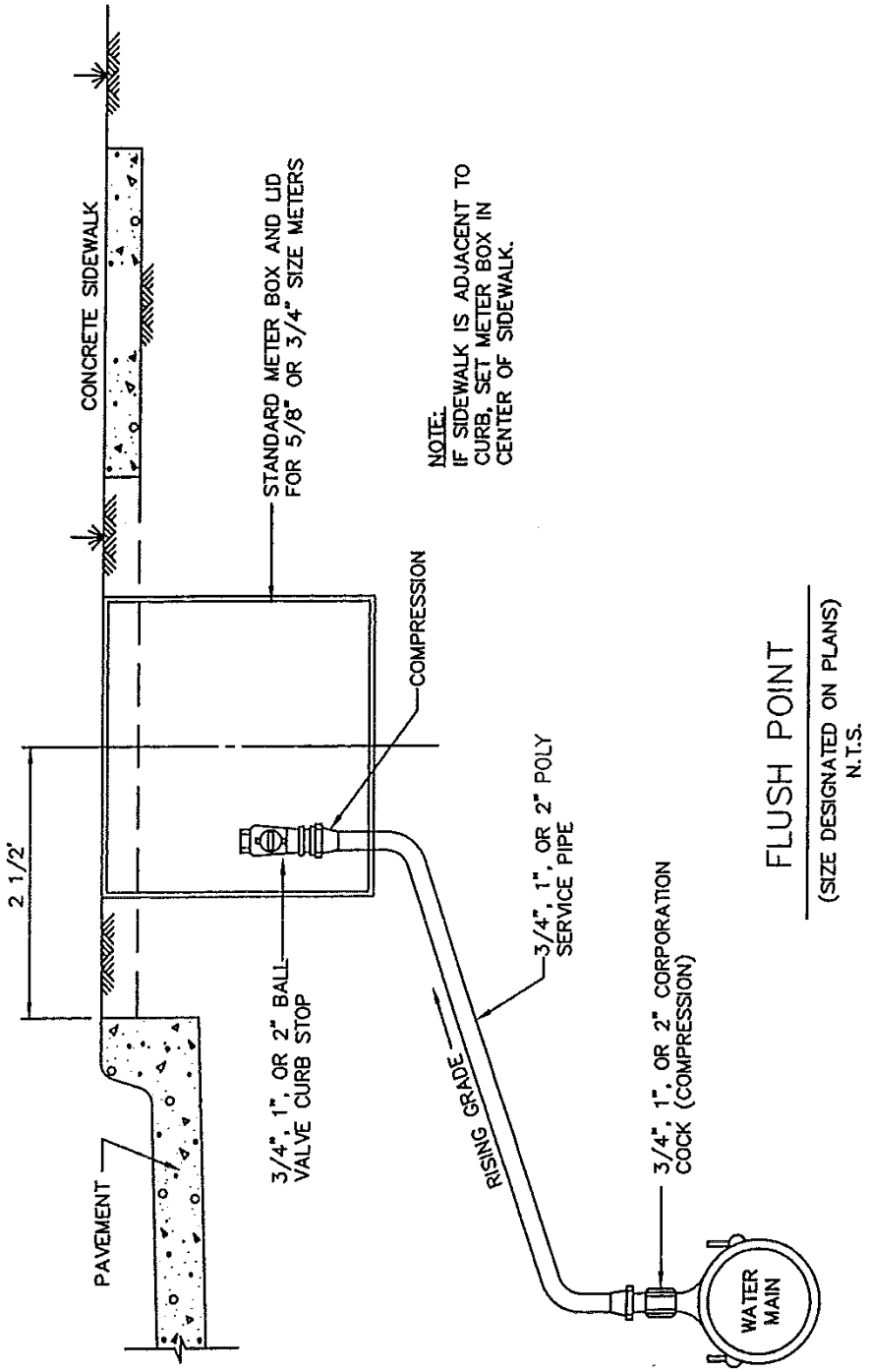
AIR VALVE	GATE VALVE	FLG. OUTLET	MIN. FITTING HEIGHT	VENT PIPE D	M.H. DIA.
2"	2"	8"	26"	2"	5'
3"	3"	18"	31"	3"	5'
4"	4"	18"	38"	4"	5'
6"	6"	18"	46"	6"	5'
8"	8"	18"	53"	8"	6'
10"	10"	20"	62"	10"	6'
12"	12"	24"	72"	12"	6'



PLAN VIEW

N.T.S.

Air Release Valve/ Air Vent Type "2"	CITY OF ANNA, TEXAS	Revision Date	Scale None
		Date Dec,2012	Sheet No. WAT-10

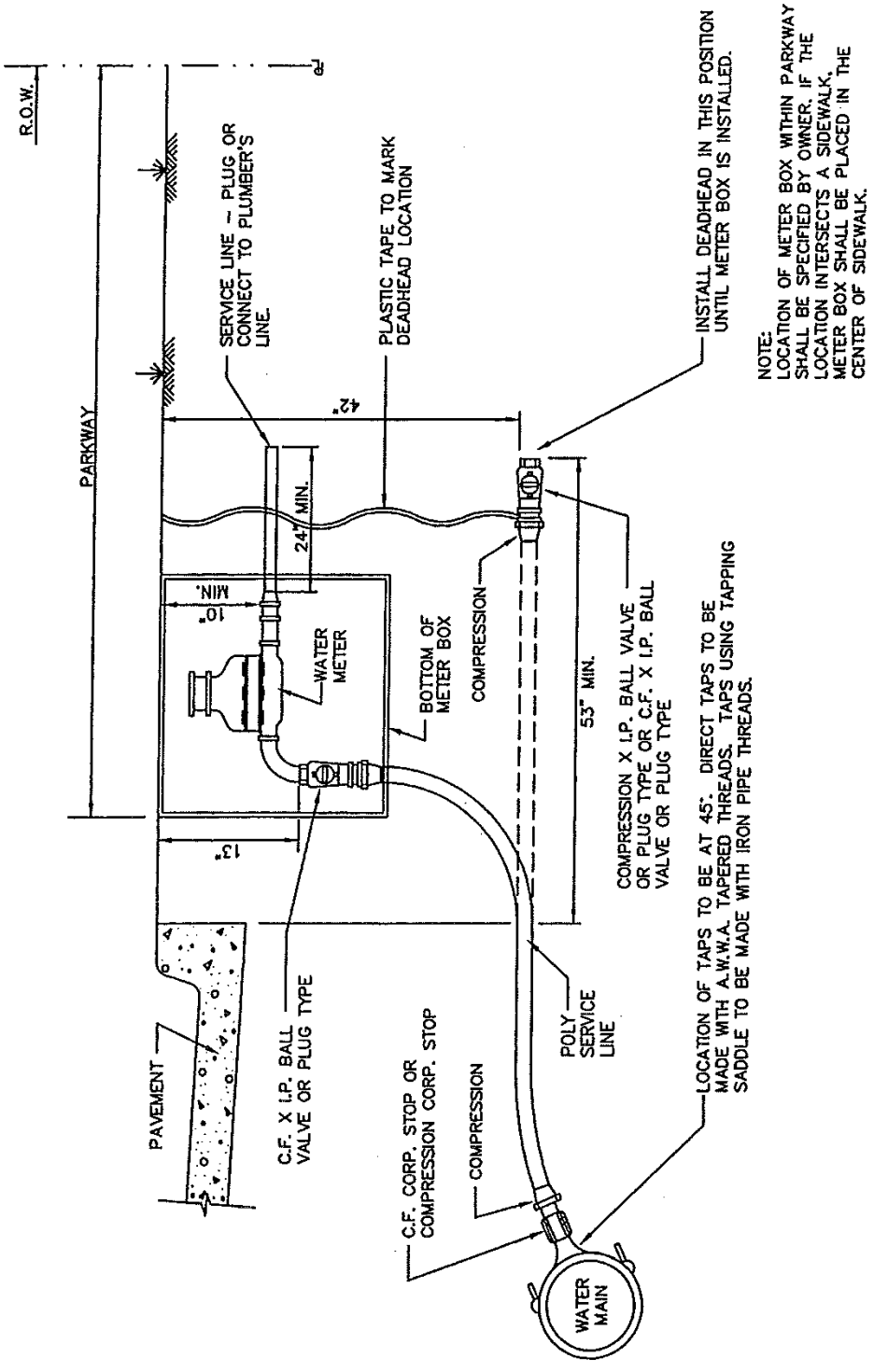


Flush Point Installation	CITY OF ANNA, TEXAS	Revision Date	Scale
Type "1"		Date	None
		Dec,2012	Sheet No.
			WAT–11

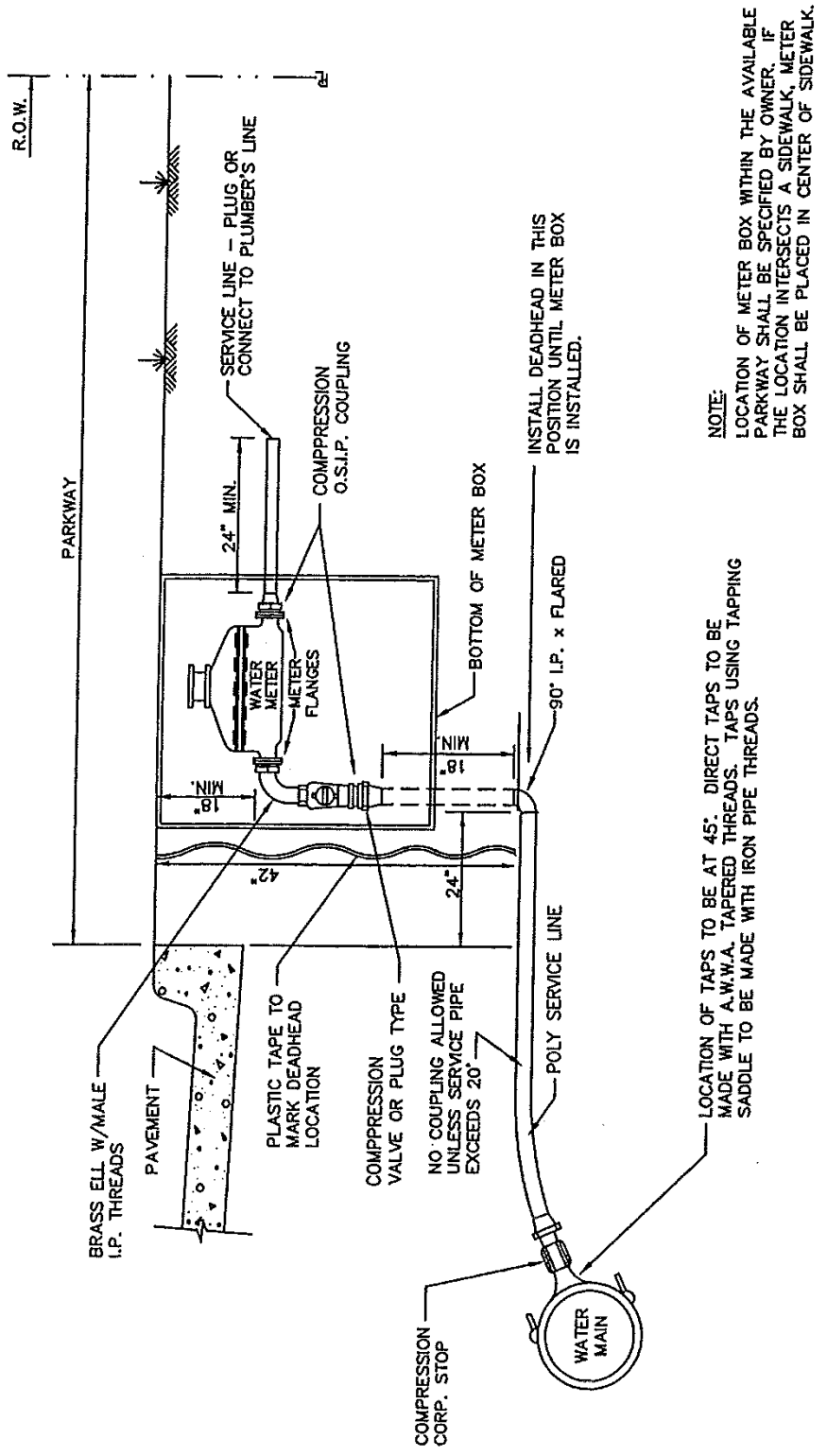
NOTES:

1. IN GENERAL, ALL FIRE HYDRANTS SHALL CONFORM TO AWWA STANDARD SPECIFICATIONS FOR FIRE HYDRANTS FOR ORDINARY WATER WORKS SERVICE, C-502. FIRE HYDRANTS SHALL HAVE A 5 1/4" MIN. VALVE OPENING AND A BARREL APPROXIMATELY 7" INSIDE DIAMETER. ALL HYDRANTS SHALL BE EQUIPPED WITH A BREAKAWAY FLANGE.
2. ALL JOINTS SHALL BE MECHANICAL JOINTS.
3. TYPICAL VALVE: ACTUAL VALVE LOCATION WILL DEPEND ON LOCATION OF WATER MAIN.
4. F.H. NO CLOSER THAN 18" TO EXISTING OR PROPOSED SIDEWALKS. (USUAL)
5. STANDARD BURY DEPTH 4' FEET
6. SET FIRE HYDRANT ON THE LOT LINE EXTENDED WHEN POSSIBLE.
7. F.H. SHALL BE LOCATED MINIMUM 1 FT. OUTSIDE OF THE AREA BETWEEN THE P.C.'S OF THE CORNER TURNING RADII AT INTERSECTIONS. (SEE PLAN VIEW)
8. PLACEMENT OF F.H. SHALL BE WHERE PUMPER NOZZLE IS PERPENDICULAR TO AND FACING THE NEAREST CURB.

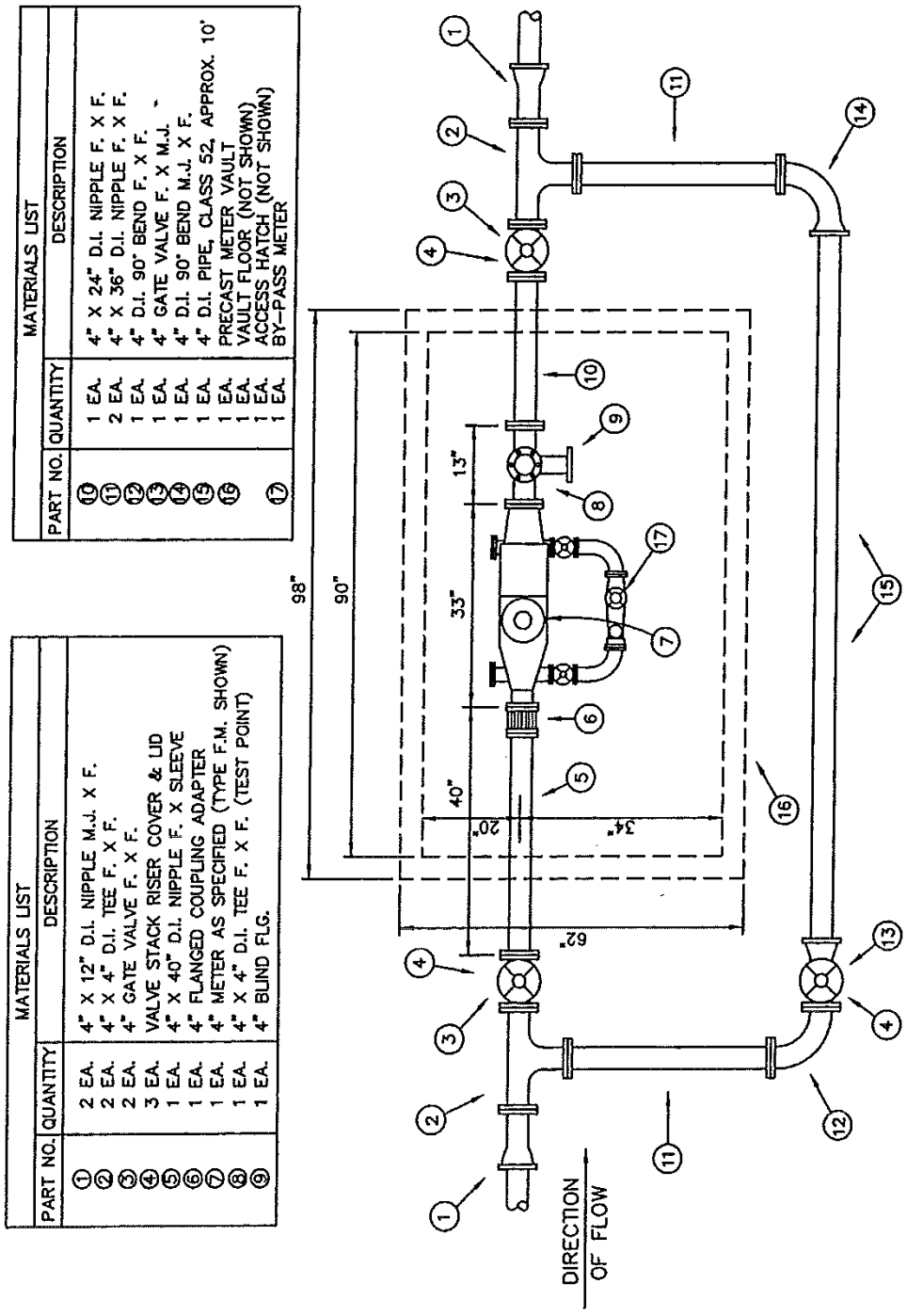
Fire Hydrant Installation	CITY OF ANNA, TEXAS	Revision Date	Scale None
		Date Dec, 2012	Sheet No. WAT-12



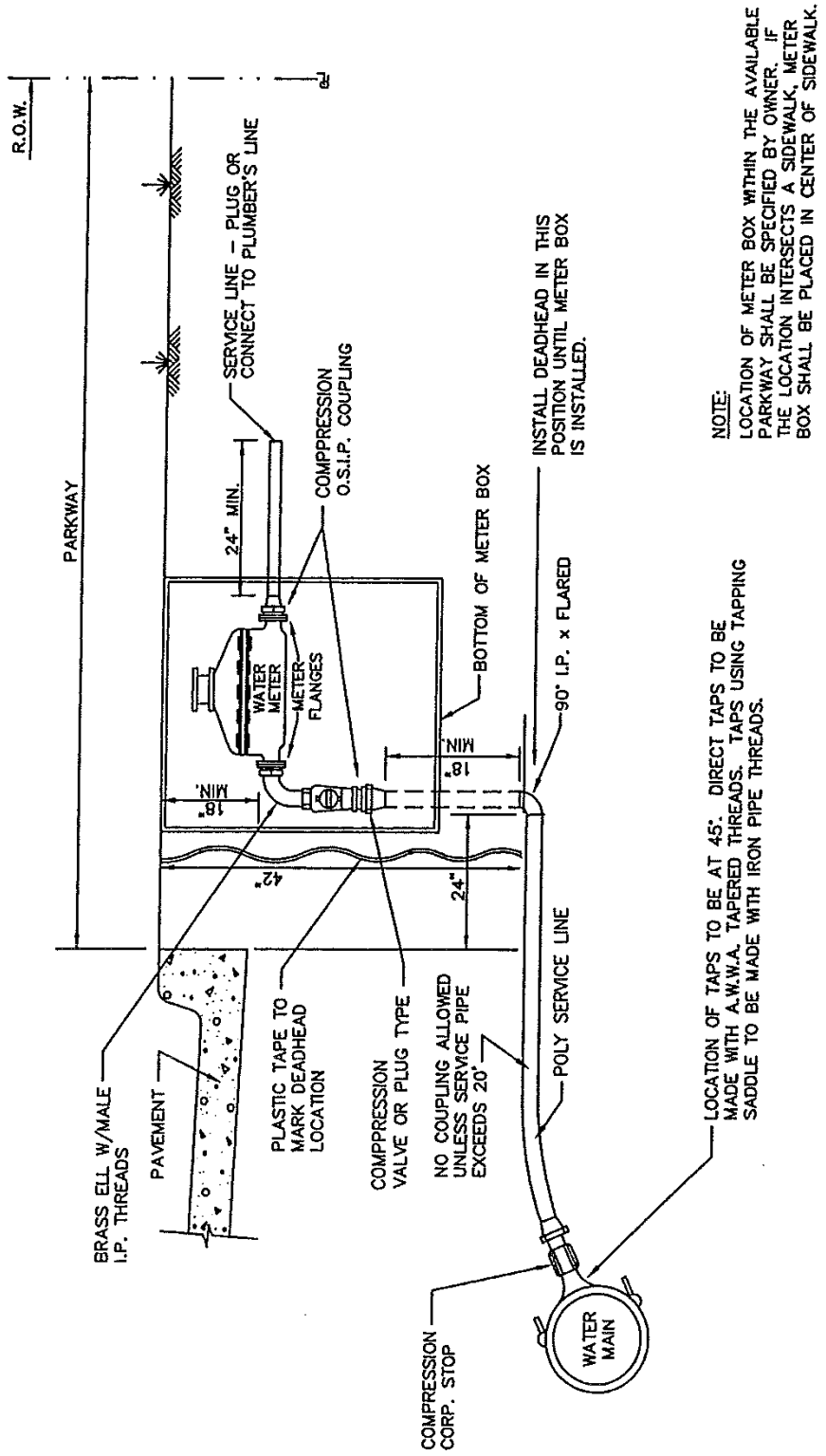
Water Service Installation	CITY OF ANNA, TEXAS	Revision Date	Scale
			None
3/4" Or 1" Line		Date	Sheet No.
		Dec, 2012	WAT–13



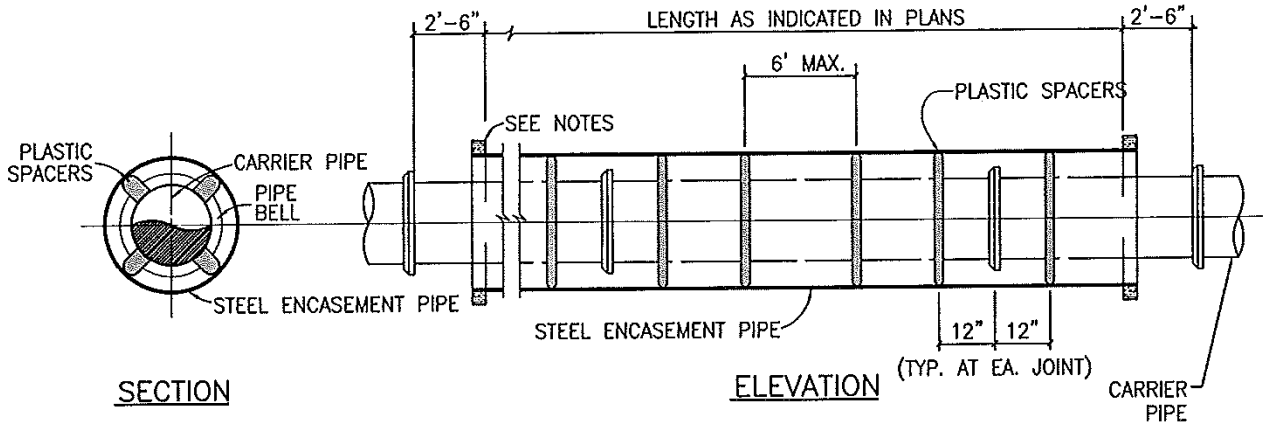
Water Service Installation	CITY OF ANNA, TEXAS	Revision Date	Scale
1–1/2" Or 2" Line		Date	Sheet No.
		Dec, 2012	WAT–14



4" Combination Water Service With 4" Meter	CITY OF ANNA, TEXAS	Revision Date	Scale None
		Date Dec,2012	Sheet No. WAT–15



Water Service Installation	CITY OF ANNA, TEXAS	Revision Date	Scale
			None
1–1/2" Or 2" Line		Date	Sheet No.
		Dec,2012	WAT–16



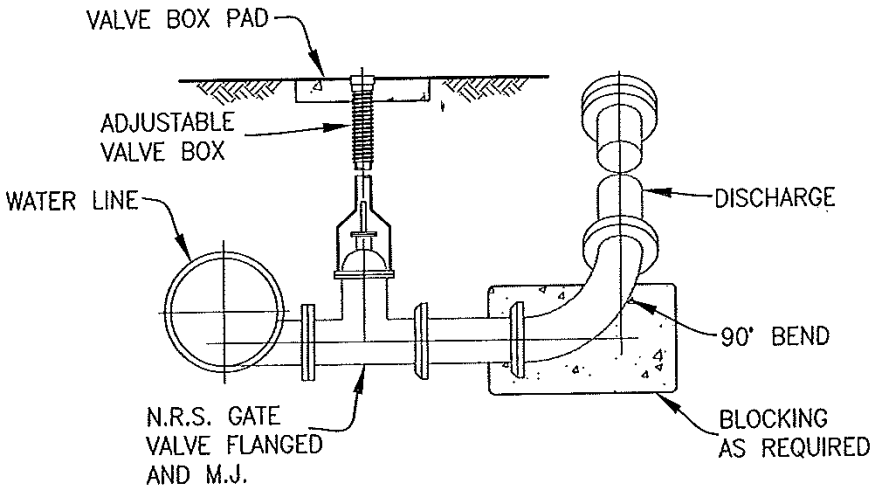
NOTES:

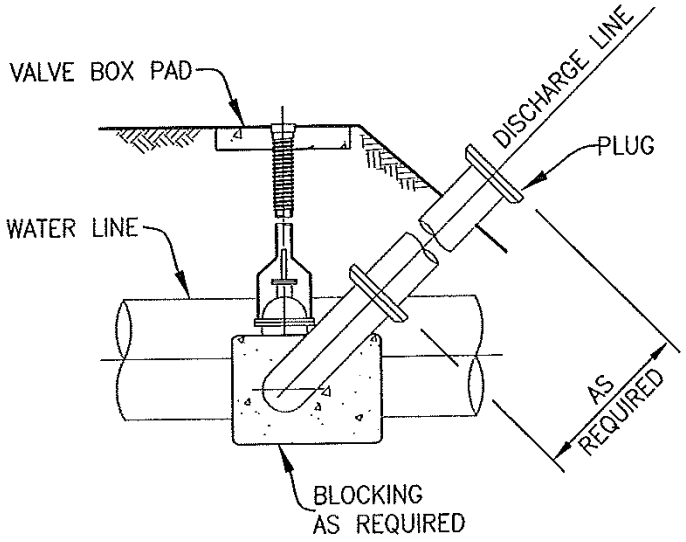
1) PREFABRICATED PLASTIC SPACERS MUST BE APPROVED BY THE OWNER.
2) CONTRACTOR SHALL PROVIDE SUPPORT UNDER CARRIER PIPE TO HAVE MIN. 1" CLEARANCE BETWEEN PIPE BELL AND ENCASEMENT PIPE.
3) ENDS OF ENCASEMENT PIPE SHALL BE PLUGGED WITH BRICK AND MORTAR FOR ROADWAY AND RAILROAD CROSSINGS. PLUGS SHALL BE CONSTRUCTED WITH A WEEP HOLE.
4) STEEL ENCASEMENT PIPES SHALL BE WELDED.
5) EXTERIOR OF ENCASEMENT PIPE SHALL BE COATED WITH AN ASPHALT VARNISH.
6) MINIMUM YIELD STRENGTH OF THE ENCASEMENT PIPE SHALL BE 35,000 P.S.I.
7) CARRIER PIPE JOINTS SHALL BE RESTRAINED.

ENCASED BORE RAILROAD OR ROADWAY

NO SCALE

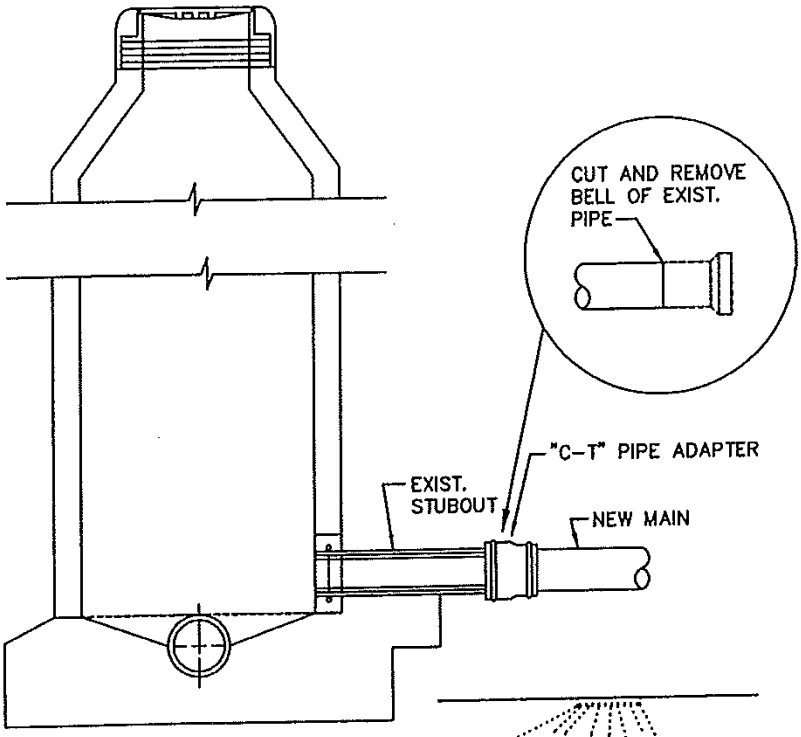
Encasement Pipe	CITY OF ANNA, TEXAS	Revision Date	Scale
			None
Water Line By Bore		Date	Sheet No.
		Dec,2012	WAT-17



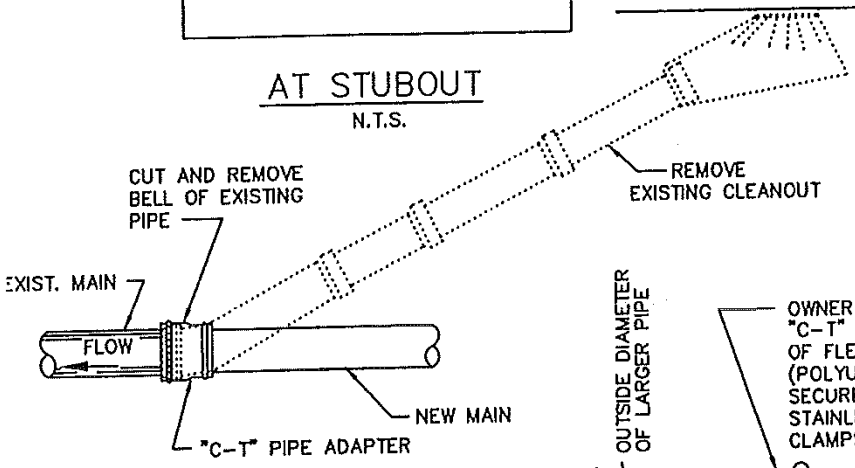


BLOW OFF VALVE

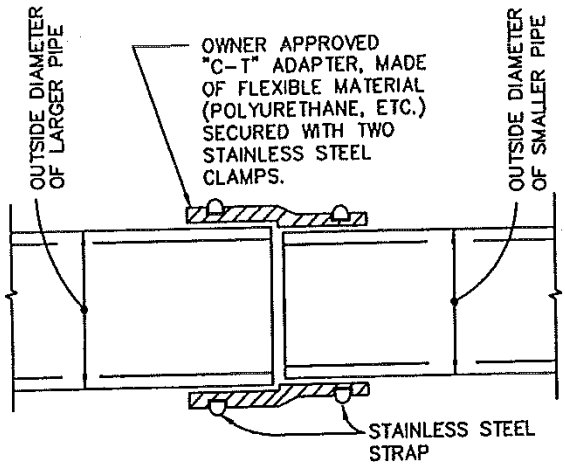
Blow Off Valve Installation	CITY OF ANNA, TEXAS Anna	Revision Date Date Dec,2012	Scale None Sheet No. WAT–18



AT STUBOUT
N.T.S.



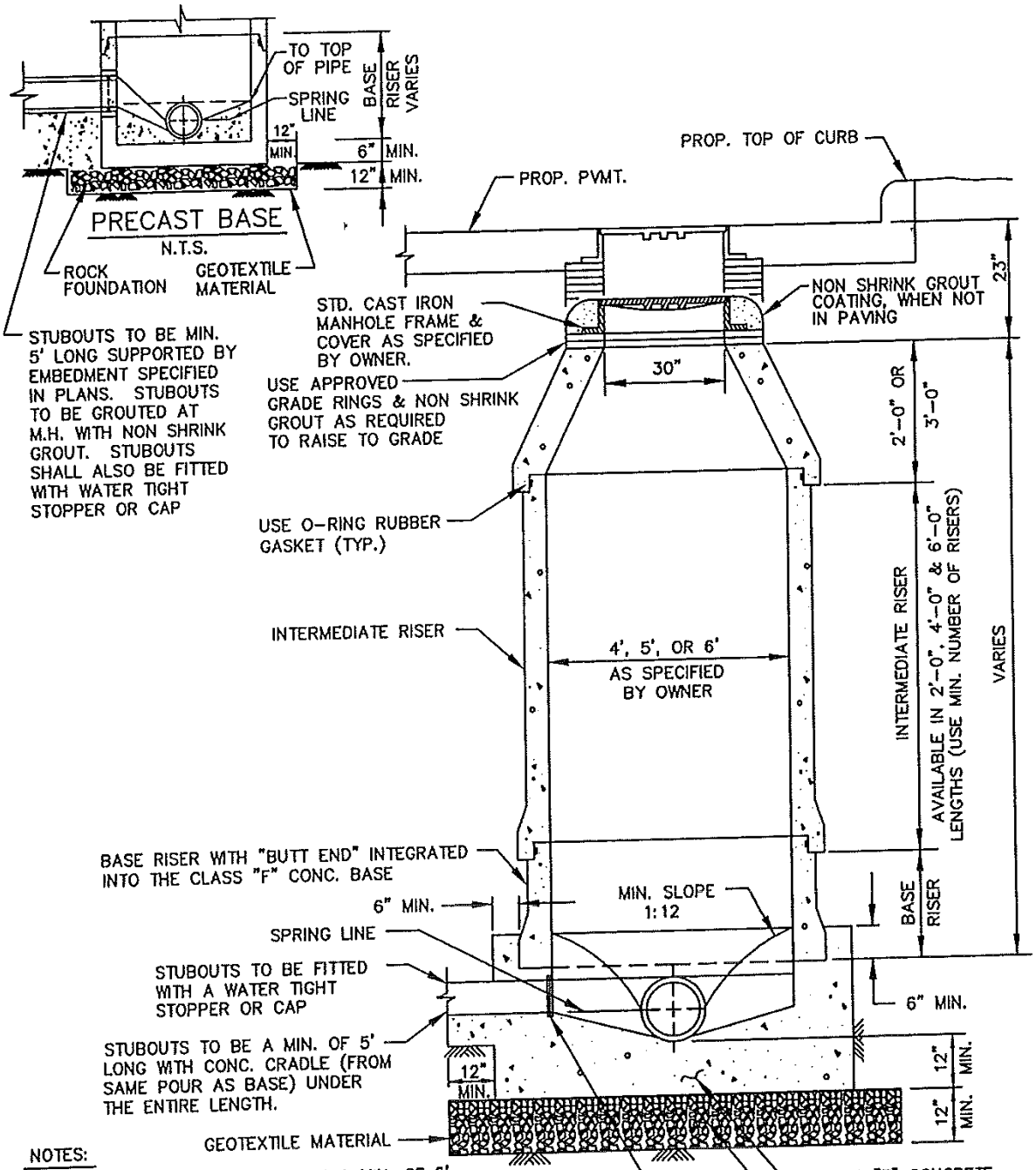
AT CLEANOUT
N.T.S.



"C-T" PIPE ADAPTER
N.T.S.

NOTE:
THIS DETAIL FOR USE ONLY WHEN NEW MAIN WILL NOT MATE WITH EXISTING MAIN JOINT DUE TO DIFFERENT DIMENSIONS OR MATERIALS AND A MANHOLE IS NOT REQUIRED.

Wastewater Main Tie–In	CITY OF ANNA, TEXAS	Revision Date	Scale
			None
At Cleanout Or Manhole Stubout		Date	Sheet No.
		Dec,2012	SS–01



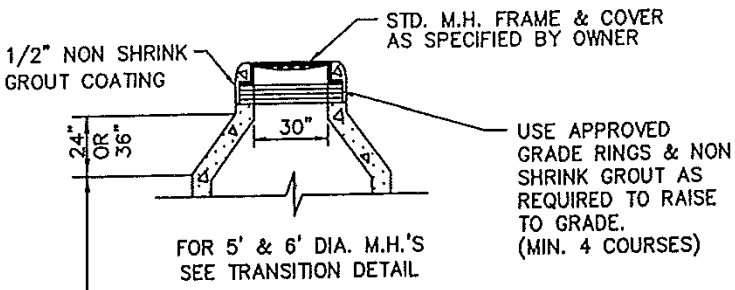
NOTES:

1. FIRST MAIN LINE JOINT TO BE A MIN. OF 5' LONG WITH CONC. CRADLE (FROM SAME POUR AS BASE) UNDER THE ENTIRE LENGTH.
2. IF FALSE M.H. BOTTOMS ARE REQUIRED, THEY SHALL BE CONSTRUCTED, INSTALLED AND REMOVED PER STD. DWG. NO. 5100.
3. WHERE M.H.'S ARE OUTSIDE OF PAVEMENT, FRAME & COVER SHALL BE CENTERED IN 5'x5' CONCRETE PAD CLASS "A" CONCRETE, 4" THICK

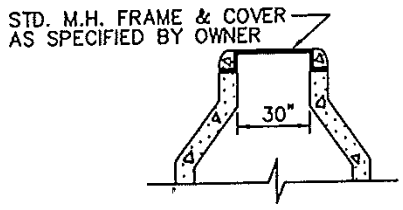
Wastewater Manhole	CITY OF ANNA, TEXAS	Revision Date	Scale
Precast			None
		Date	Sheet No.
		Dec,2012	SS-02

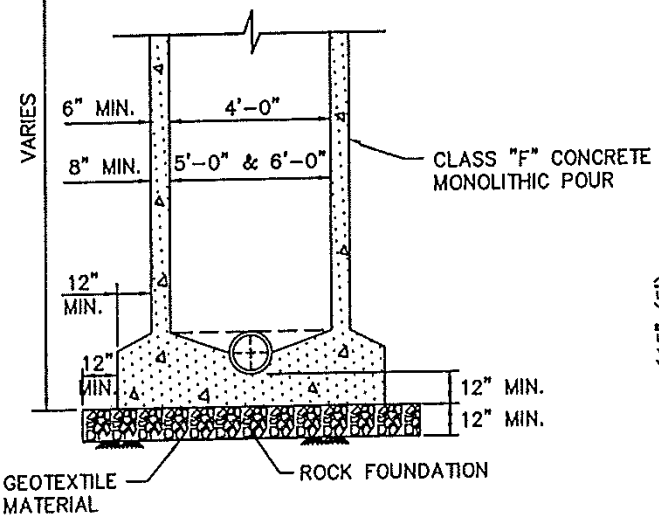
ROOF OPTIONS
N.T.S.

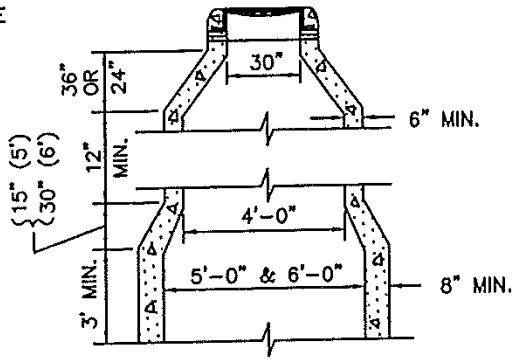
ADJUSTABLE FRAME



FRAME CAST IN CONC.



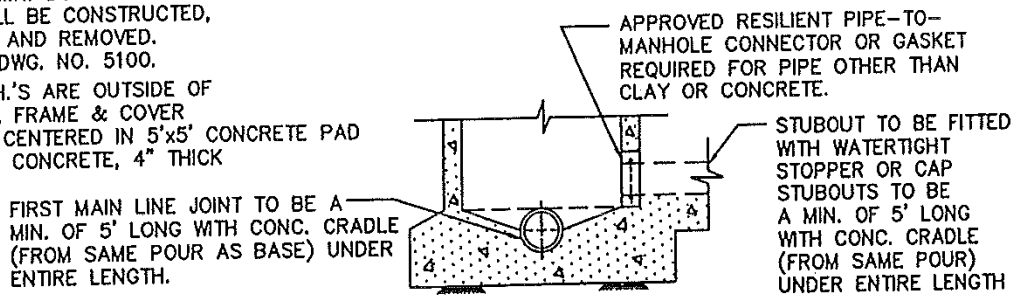




TRANSITION DETAIL FOR 5' & 6' DIA. M.H.'S
N.T.S.

NOTES

1. WHERE M.H.'S ARE IN "PROPOSED" PAVING, FRAME & COVER SHALL BE SET 23" BELOW THE PROPOSED TOP OF CURB.
2. IF FALSE M.H. BOTTOMS ARE REQUIRED THEY SHALL BE CONSTRUCTED, INSTALLED AND REMOVED. PER STD. DWG. NO. 5100.
3. WHERE M.H.'S ARE OUTSIDE OF PAVEMENT, FRAME & COVER SHALL BE CENTERED IN 5'x5' CONCRETE PAD CLASS "A" CONCRETE, 4" THICK

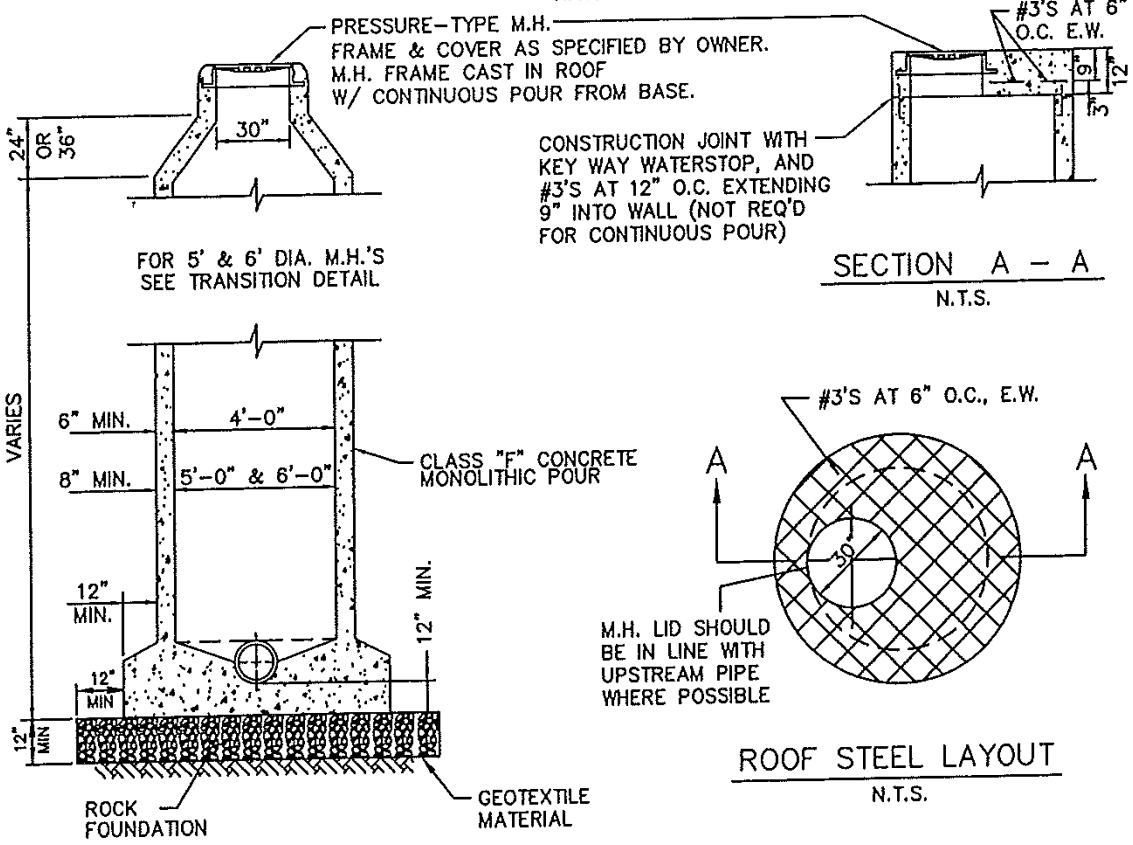


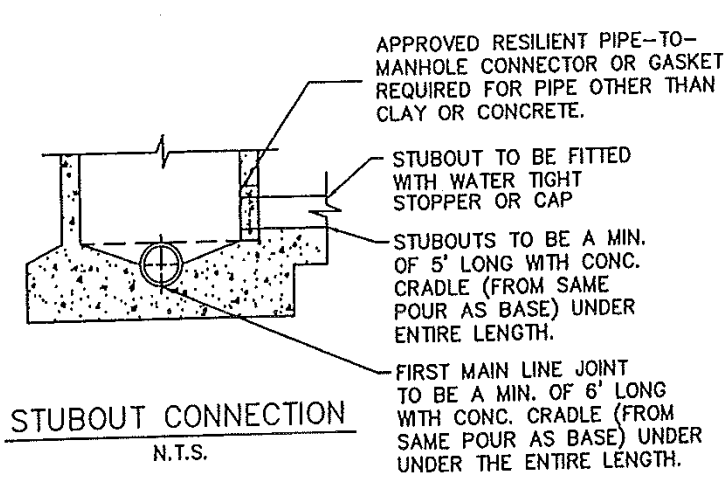
STUBOUT CONNECTION
N.T.S.

Wastewater Manhole Cast-In-Place	CITY OF ANNA, TEXAS Anna	Revision Date Date Dec,2012	Scale None Sheet No. SS-03

CONCRETE CONE ⇦ ROOF OPTIONS ⇨ REINFORCED CONCRETE SLAB

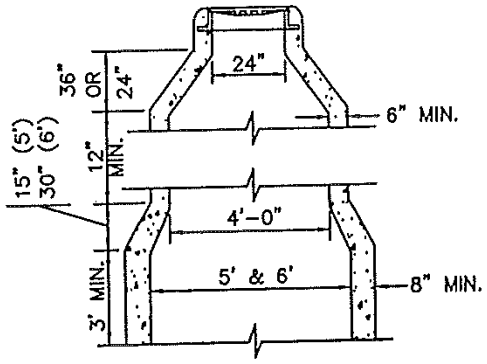
N.T.S.





STUBOUT CONNECTION

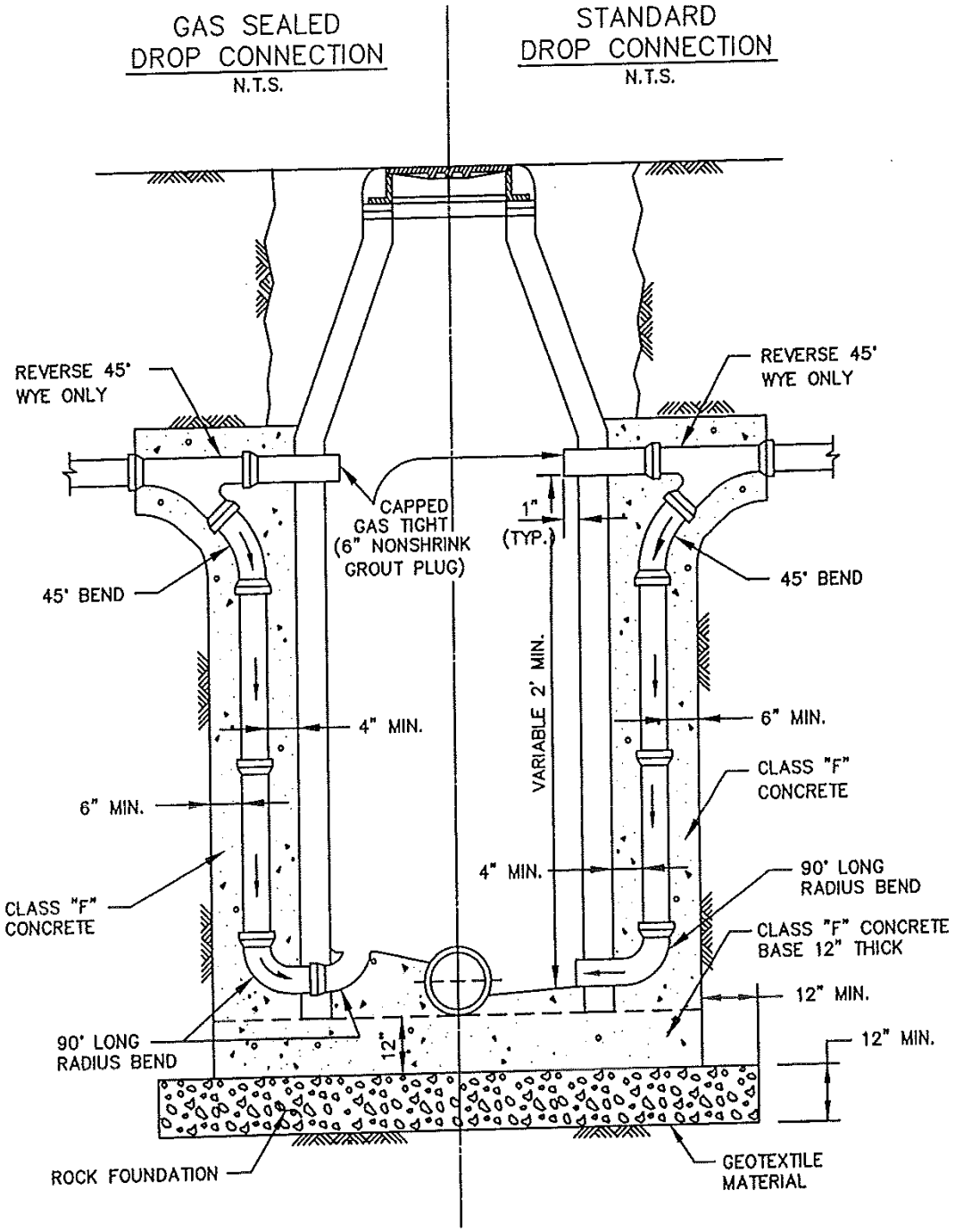
N.T.S.



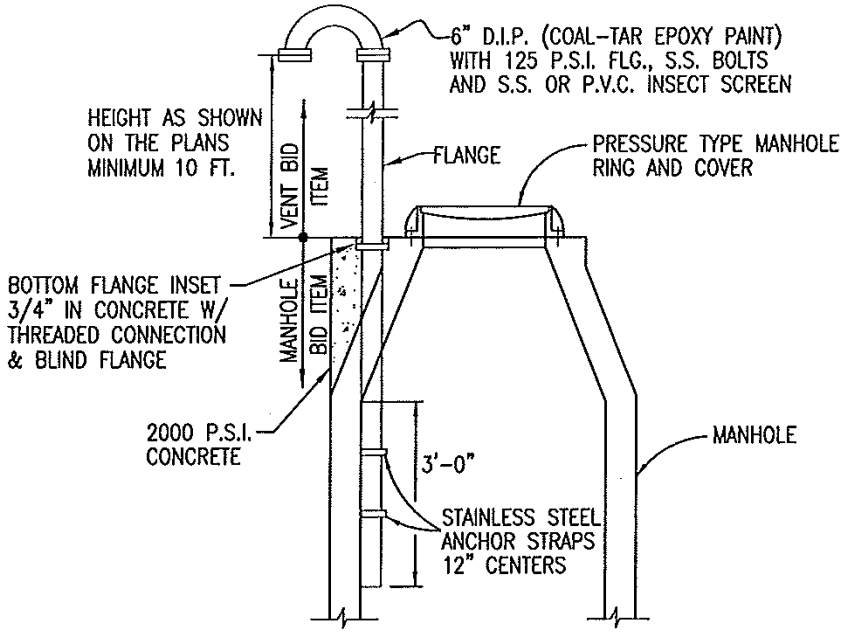
TRANSITION DETAIL FOR 5' & 6' DIA. M.H.'S

N.T.S.

Wastewater Manhole	CITY OF ANNA, TEXAS	Revision Date	Scale: None
Pressure Manhole		Date: Dec,2012	Sheet No.: SS-04

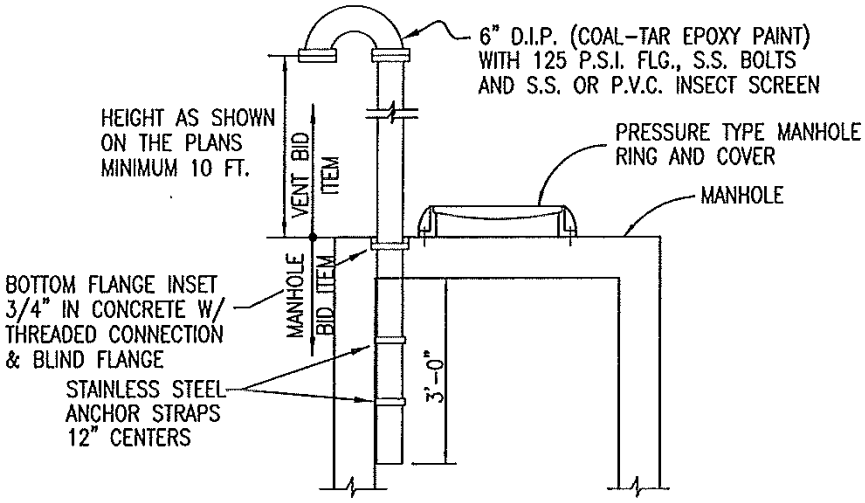


Wastewater Manhole	CITY OF ANNA, TEXAS	Revision Date	Scale
			None
Outside Drop Connection		Date	Sheet No.
		Dec,2012	SS–05



CONE TOP MANHOLE VENT

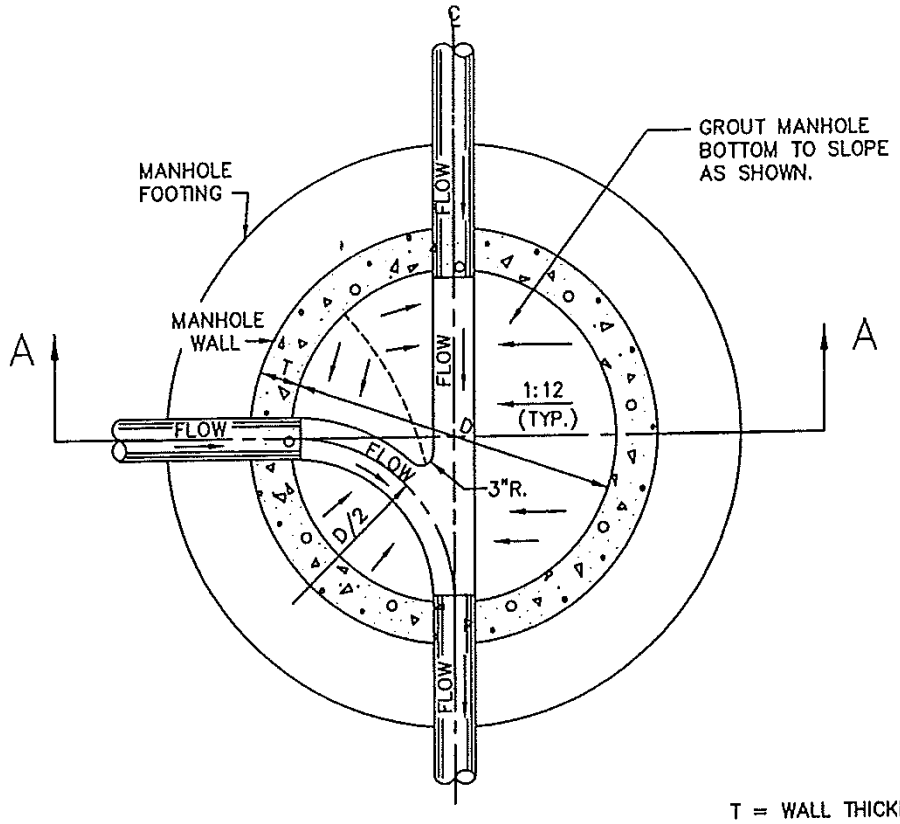
NO SCALE



FLAT TOP MANHOLE VENT

NO SCALE

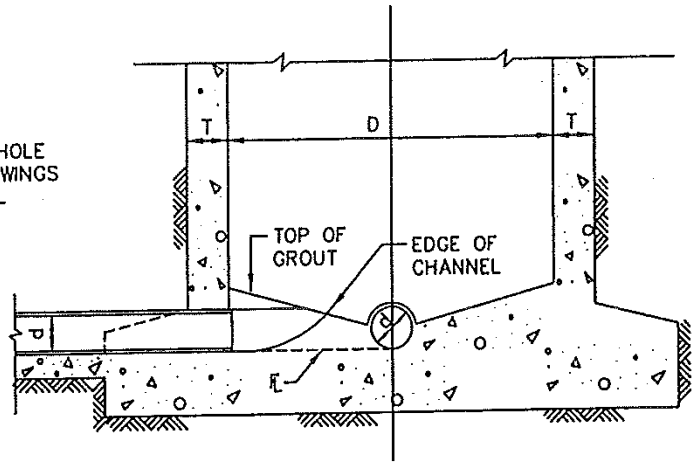
Wastewater Manhole	CITY OF ANNA, TEXAS	Revision Date	Scale
			None
Vented		Date	Sheet No.
		Dec,2012	SS-06



PLAN
N.T.S.

T = WALL THICKNESS
D = MANHOLE DIAMETER
d = PIPE DIAMETER

NOTE:
REFER TO MANHOLE STANDARD DRAWINGS FOR ADDITIONAL DETAIL OF M.H.



SECTION A–A
N.T.S.

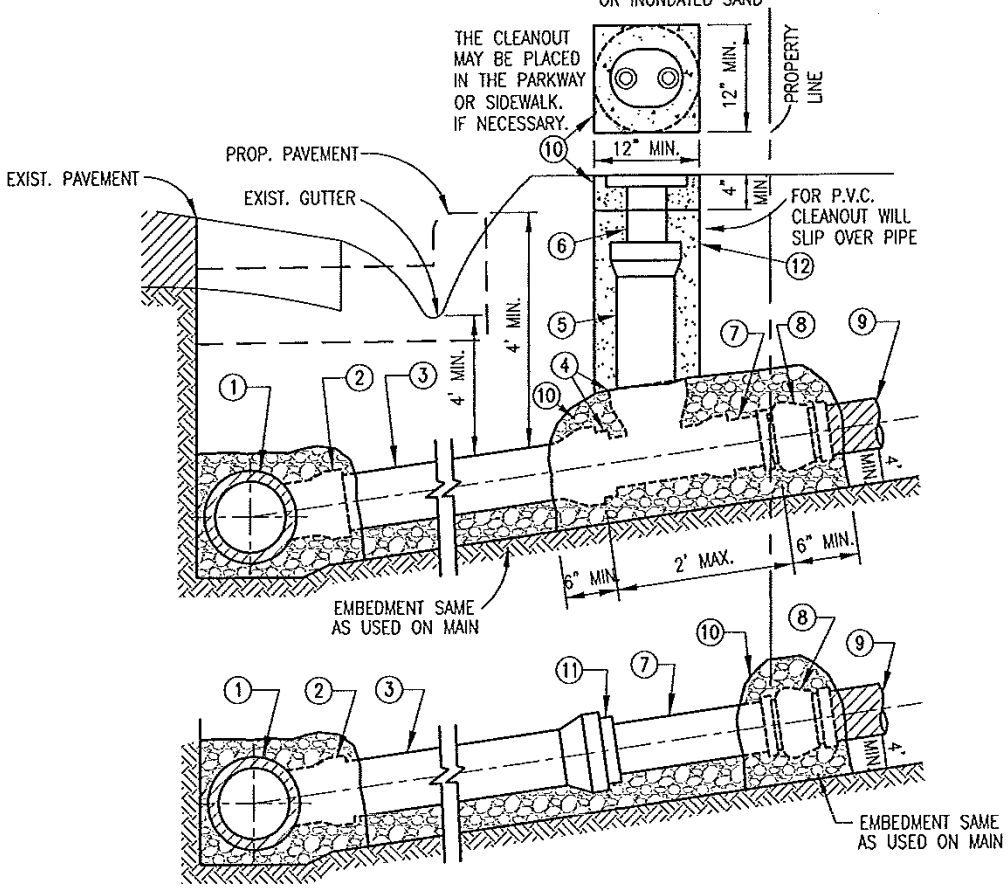
Wastewater Manhole Line Intersection	CITY OF ANNA, TEXAS Anna	Revision Date Date Dec, 2012	Scale None Sheet No. SS–07

H'	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	H'
Y'	10	12	14	17	19	22	24	27	29	31	34	36	39	41	43	46	48	Y'

Wastewater Main	CITY OF ANNA, TEXAS	Revision Date	Scale
			None
Cleanout		Date	Sheet No.
		Dec,2012	SS–08

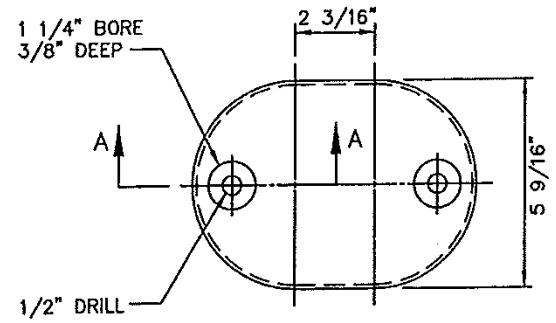
KEY:

1. WASTEWATER MAIN
2. 4" WYE
3. 4" WASTEWATER SERVICE (LENGTH VARIES)
4. 4" x 4" TEE OR WYE AS REQ'D BY OWNER.
5. 4" STACK (LENGTH VARIES)
6. 4" WASTEWATER SERVICE CLEANOUT CASTING
7. 4" WASTEWATER PIPE (LENGTH VARIES)
8. ADAPTOR
9. BUILD SEWER SERVICE
10. CLASS "B" CONCRETE
11. 6" x 4" REDUCER
12. COMPACTED AS SPECIFIED, OR INUNDATED SAND

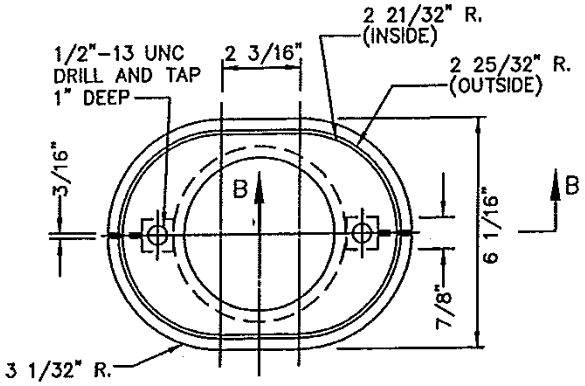


1. CLEANOUT CASTING TO BE FURNISHED AND PLACED PER SPECIAL CONDITIONS. IN VEHICLE TRAFFIC AREAS AND FOR COMMERCIAL MAINLINE SERVICES, WASTEWATER CLEANOUT SHALL BE OF CAST IRON.
2. SLOPE OF SERVICE TO BE 2% MIN., UNLESS INSTRUCTED OTHERWISE BY OWNER.
3. THE WASTEWATER SERVICE SHALL BE CONNECTED TO BUILDING SERVICE AND CONSTRUCTED IN SUCH MANNER AS TO CLEAR EXISTING UTILITIES AND PROPOSED FACILITIES SUCH AS STORM SEWER MAINS, PAVING, SIDEWALK, RETAINING WALLS, ETC. VERTICAL BENDS (22.5 MAX.) MAY BE USED IF APPROVED BY OWNER.
4. THE MAINLINE SERVICE CONNECTION TO THE PRIVATE BUILDING SERVICE SHALL BE AS CLOSE TO THE PROPERTY LINE AS POSSIBLE.
5. INSTALL 4" STOPPER OR CAP AT PROPERTY LINE IF BUILDING SERVICE DOES NOT EXIST.
6. SUBSTITUTE 4" FOR 6" FITTINGS IF PLANS OR SPEC. COND. CALL FOR 4" SERVICE.
7. THE CLEANOUT STACK & CASTING MY BE PLACED IN THE PARKWAY, VEHICLE TRAFFIC AREAS, OR SIDEWALK IF NECESSARY.
8. FOR 6" SERVICES OR LARGER, INSTALL A MANHOLE.

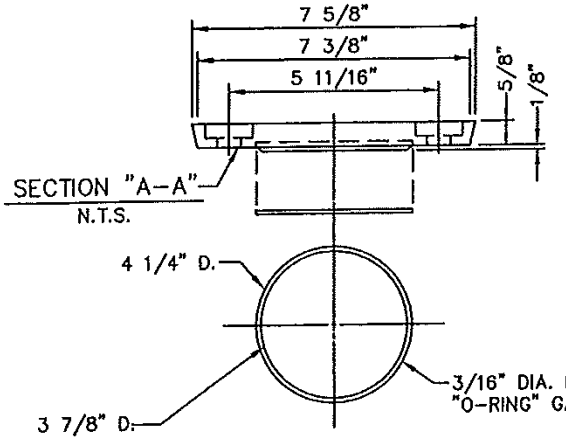
Wastewater Services	CITY OF ANNA, TEXAS	Revision Date	Scale
			None
With & Without Cleanout		Date	Sheet No.
		Dec,2012	SS–09

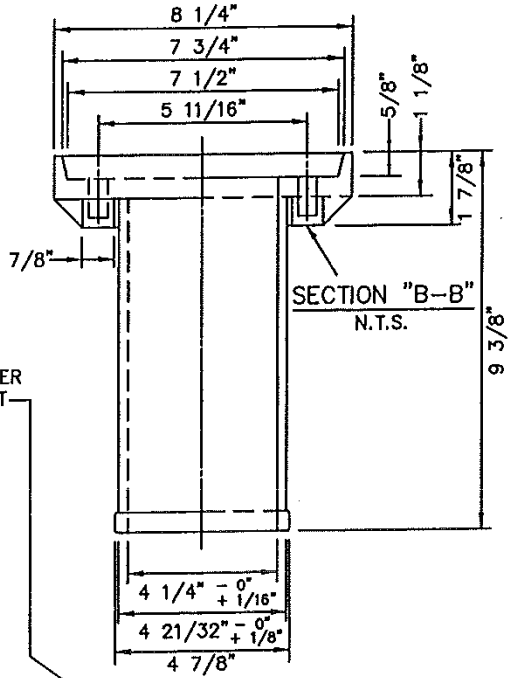


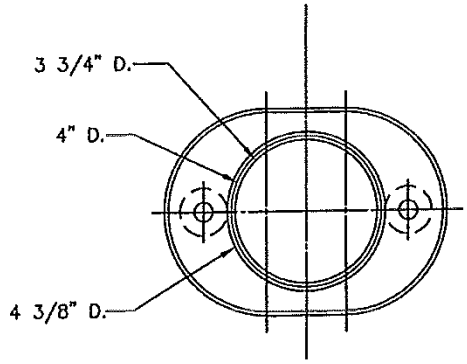
COVER
N.T.S.



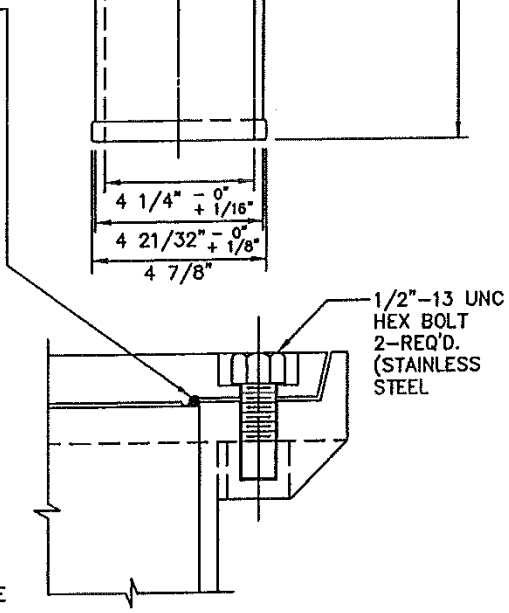
CLEANOUT FRAME TOP
N.T.S.







CLEANOUT FRAME BOTTOM
N.T.S.

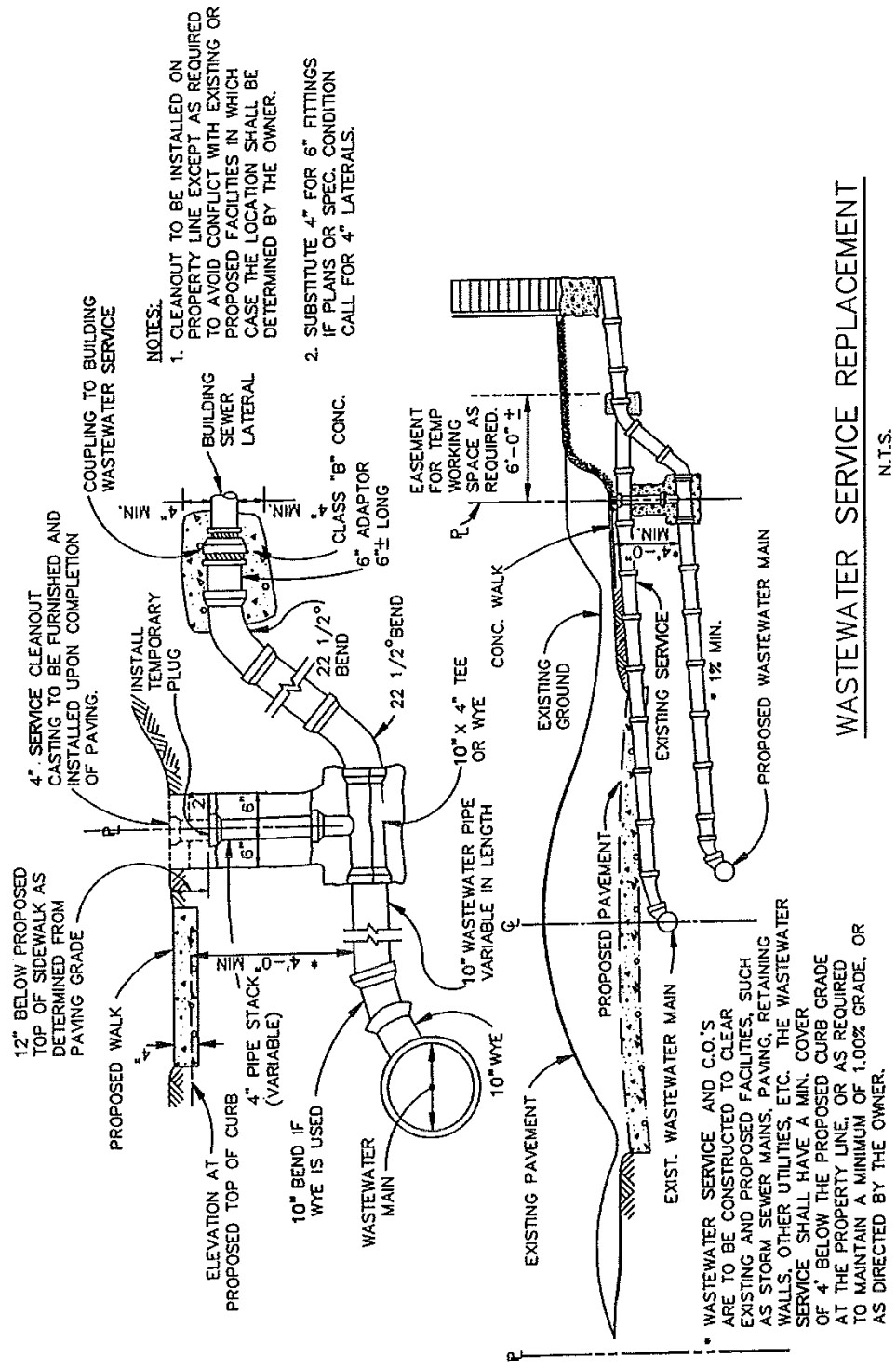


ASSEMBLY VIEW
N.T.S.

NOTES:

1. THE WORDS "WASTEWATER LATERAL CLEANOUT" SHALL BE CAST INTO TOP OF COVER.
2. CLEANOUTS LOCATED WITHIN PAVED SURFACES SHALL BE CAST IRON. ALL OTHERS SHALL BE PVC.

Wastewater Service	CITY OF ANNA, TEXAS	Revision Date	Scale: None
Cleanout Frame & Cover	Anna	Date: Dec,2012	Sheet No.: SS-10



WASTEWATER SERVICE REPLACEMENT

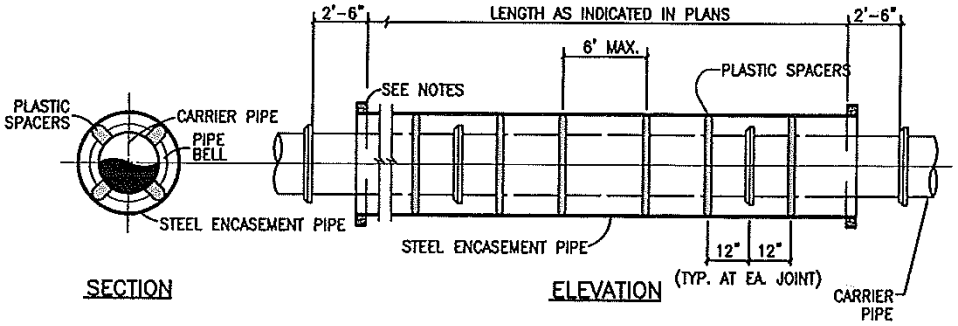
N.T.S.

Wastewater Service Replacement Advance Of Paving	CITY OF ANNA, TEXAS Anna	Revision Date Date Dec,2012	Scale None Sheet No. SS–11

WASTEWATER SERVICE STUBOUT

(FOR FUTURE CONNECTION, 4" OR 6" AS SPECIFIED)
N.T.S.

Wastewater Service Stubout	CITY OF ANNA, TEXAS	Revision Date	Scale
			None
Advance of Paving	Anna	Date	Sheet No.
		Dec,2012	SS–12



NOTES:

1) PREFABRICATED PLASTIC SPACERS MUST BE APPROVED BY THE OWNER.
2) CONTRACTOR SHALL PROVIDE SUPPORT UNDER CARRIER PIPE TO HAVE MIN. 1" CLEARANCE BETWEEN PIPE BELL AND ENCASEMENT PIPE.
3) ENDS OF ENCASEMENT PIPE SHALL BE PLUGGED WITH BRICK AND MORTAR FOR ROADWAY AND RAILROAD CROSSINGS. PLUGS SHALL BE CONSTRUCTED WITH A WEEP HOLE.
4) STEEL ENCASEMENT PIPES SHALL BE WELDED.
5) EXTERIOR OF ENCASEMENT PIPE SHALL BE COATED WITH AN ASPHALT VARNISH.
6) MINIMUM YIELD STRENGTH OF THE ENCASEMENT PIPE SHALL BE 35,000 P.S.I.
7) CARRIER PIPE JOINTS SHALL BE RESTRAINED.

ENCASED BORE RAILROAD OR ROADWAY

NO SCALE

Encasement Pipe	CITY OF ANNA, TEXAS	Revision Date	Scale
			None
Wastewater Line By Bore		Date	Sheet No.
		Dec,2012	SS-13

CLASS "G"

N.T.S.

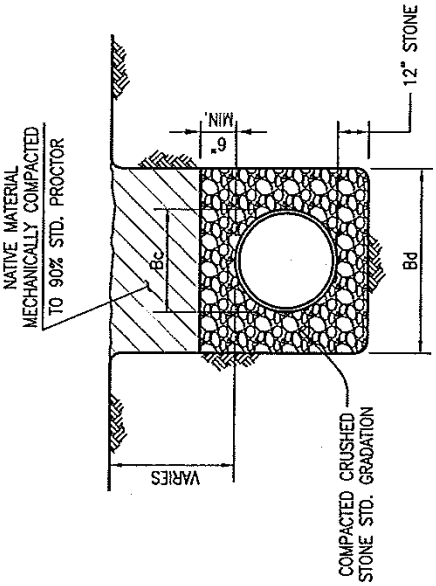
1. Bc = OUTSIDE DIAMETER OF PIPE
2. Bd = TRENCH WIDTH
3. D = INSIDE DIAMETER OF PIPE

WATER LINE EMBEDMENT

N.T.S.

1. Bc = OUTSIDE DIAMETER OF PIPE
2. Bd = TRENCH WIDTH
3. D = INSIDE DIAMETER OF PIPE

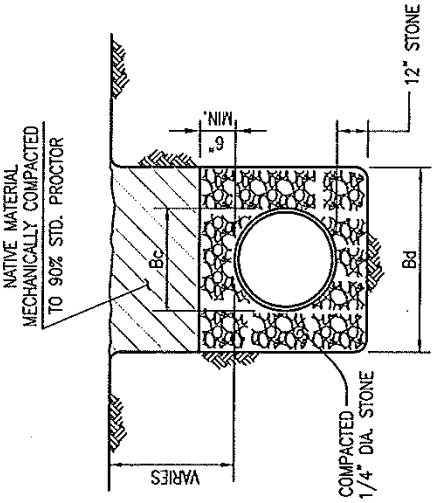
Embedment	CITY OF ANNA, TEXAS	Revision Date	Scale
Water Line Embed. & Class "G"	Anna	Date: Dec,2012	None Sheet No.: EMB –01



STORM SEWER EMBEDMENT

N.T.S.

1. Bd = TRENCH WIDTH
2. Bc = OUTSIDE DIAMETER OF PIPE
3. D = INSIDE DIAMETER OF PIPE

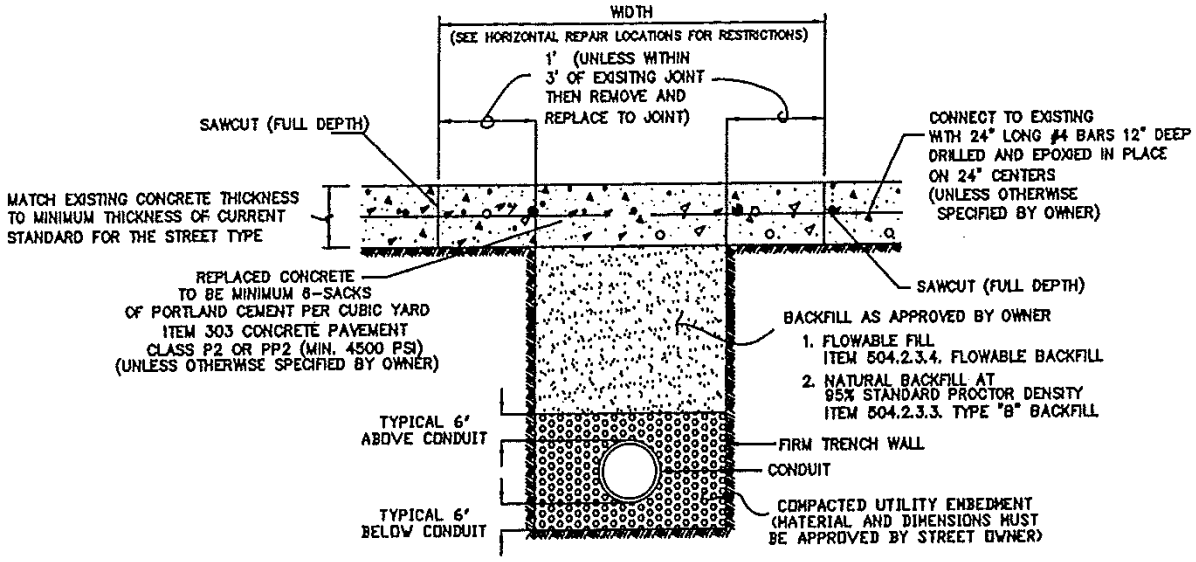


SANITARY SEWER EMBEDMENT

N.T.S.

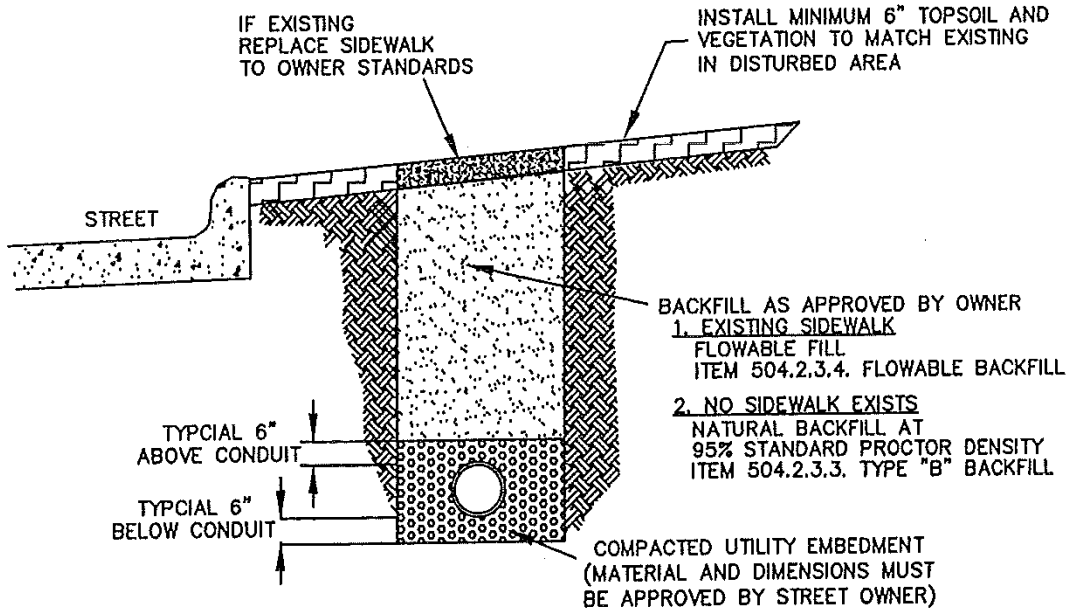
1. Bd = TRENCH WIDTH
2. Bc = OUTSIDE DIAMETER OF PIPE
3. D = INSIDE DIAMETER OF PIPE

Embedment	CITY OF ANNA, TEXAS	Revision Date	Scale
			None
STORM SEWER & SANITARY SEWER		Date	Sheet No.
		Dec,2012	EMB–02



CONCRETE PAVEMENT

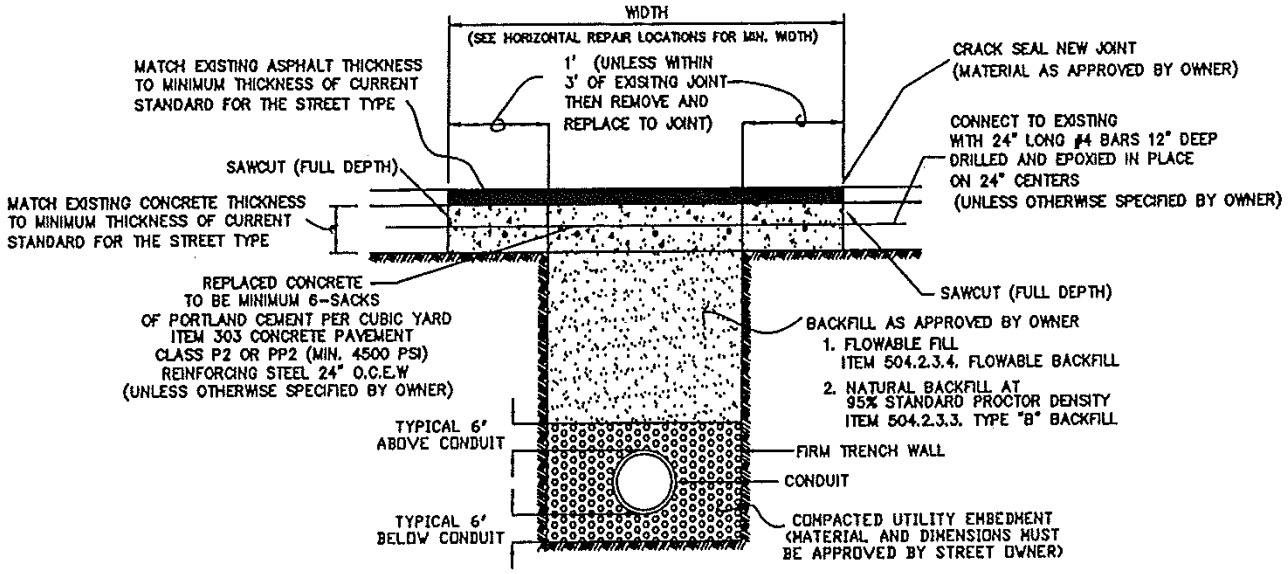
N.T.S.



STREET PARKWAY

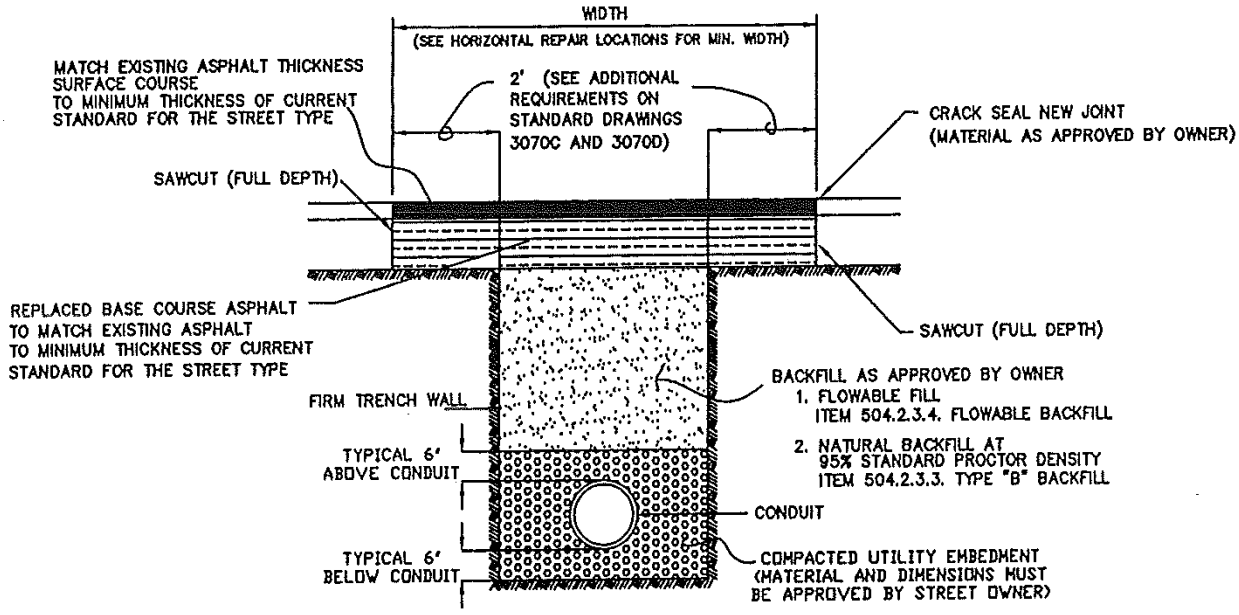
N.T.S.

Pavement Cut Rerair	CITY OF ANNA, TEXAS ★ Anna	Revision Date	Scale None
Concrete And Parkway		Date Dec,2012	Sheet No. EMB-03



CONCRETE PAVEMENT WITH ASPHALT OVERLAY

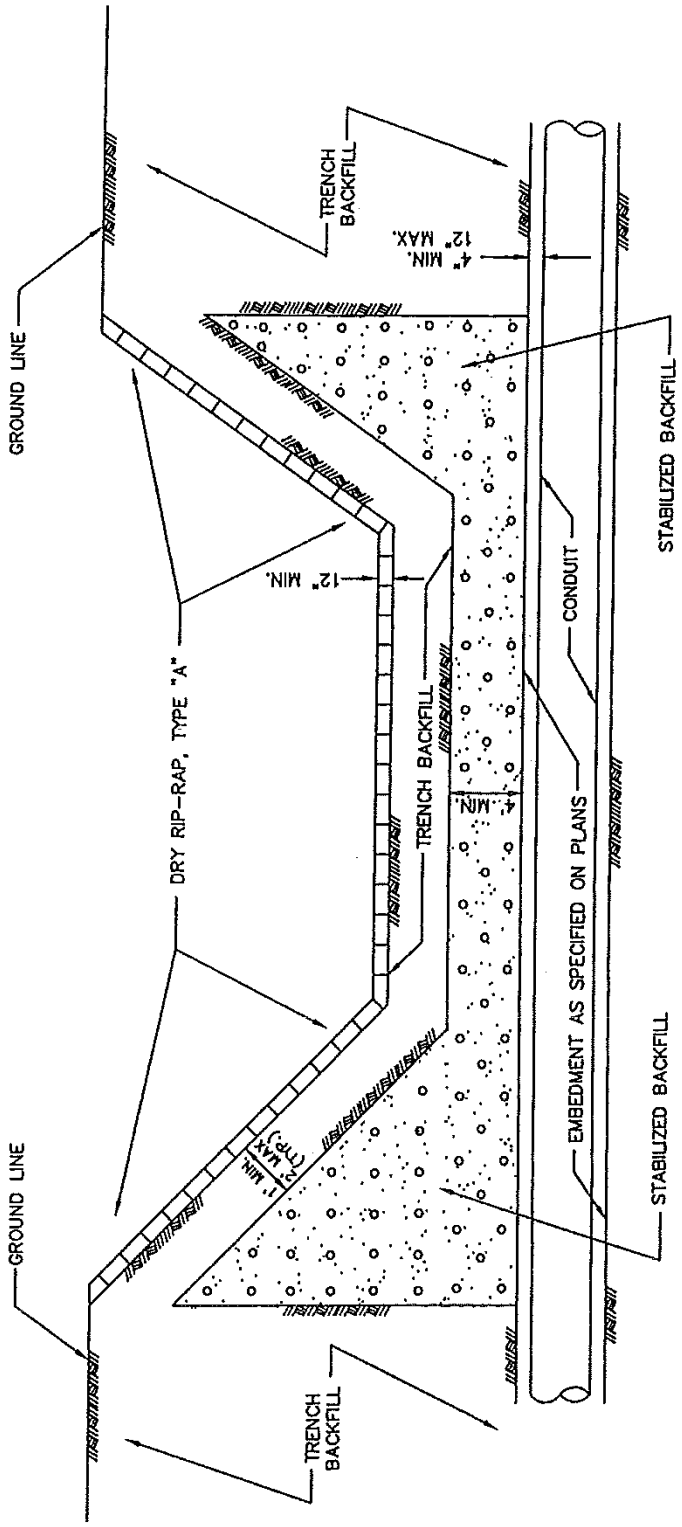
N.T.S.



FULL DEPTH ASPHALT PAVEMENT

N.T.S.

Pavement Cut And Repair	CITY OF ANNA, TEXAS	Revision Date	Scale
			None
Asphalt		Date	Sheet No.
		Dec,2012	EMB–04



Infiltration Protection	CITY OF ANNA, TEXAS	Revision Date	Scale
			None
Conduit Under Channel	Anna	Date	Sheet No.
		Dec, 2012	EMB–05

Section 9. GENERAL CONSTRUCTION NOTES

(See following page)

GENERAL ITEMS

1. Prior to any construction the Contractor shall be familiar with the Contract Documents and Specifications, the Plans (including all notes). The City of Anna Specifications and any other applicable standards or specifications relevant to the proper completion of the work specified. Failure on the part of the Contractor to be familiar with all Standards and Specifications pertaining to this work shall in no way relieve the Contractor of responsibility for performing the work in accordance with all such applicable Standards and Specifications.
2. Construction may not start earlier than 7:00 am on weekdays nor continued after dark without prior permission from the city of Anna. Construction on Saturday may not start before 7:00 am and work on Sunday is prohibited without special permission. A fee of $150 must be paid to the city by Thursday noon prior to Saturday work, if city inspection is required.
3. Prior to construction, Contractor shall have in their possession all necessary permits, plans, licenses, etc. Contractor shall have at least one set of approved Engineering Plans and Specifications on-site at all times.
4. All work shall conform to the City of Anna Standard Design and Specification Manual. In the event an item is not covered in the plans or the City of Anna Standard Design and Specification Manual, the most current North Central Texas Council of Governments (NCTCOG) Standard Specifications for Public Works Construction shall apply with concurring notification to the City and Project Engineer. The City shall have the final decision on all construction materials, methods, and procedures.
5. Construction inspection will be performed by representatives of the Owner, Engineer, City, Geotechnical Engineer, and reviewing authorities and agencies. Unrestricted access shall be provided to them at all times. Contractor is responsible for understanding and scheduling required inspections. Testing samples shall be collected and processed by certified technicians.
6. All contractors must confine their activities to the work area. No encroachments onto developed or undeveloped areas will be allowed. Any damage resulting therefrom shall be Contractor's responsibility to repair.
7. Developer shall be responsible for obtaining all offsite easements prior to commencement of offsite and relevant on-site construction activities.
8. It will be the responsibility of each contractor to protect all existing public and private utilities throughout the construction of this project. Contractor shall contact the appropriate utility companies for line locations prior to commencement of construction and shall assume kill liability to those companies for any damages caused to their facilities.
9. Trench Safety Design will be the responsibility of the Utility Contractor. Contractor shall submit a trench safety design approved by a professional engineer to the City for their records prior to the start of any underground utility construction.
10. Work may not be backfilled or covered until it has been inspected by the City.
11. Continuous access for mail service shall be provided during construction.
12. If any conflict arises between these generals notes and any other notes found in the plans, the City General Notes shall take precedence.

EROSION CONTROL & VEGETATION

1. Every soil disturbing activity shall have an accompanying Erosion Control Plan (ECP), Storm Water Pollution Prevention Plan (SWPPP) and either Construction Site Notice (CSN) for those activities disturbing more than 1 but less than 5 acres, or Notice of Intent (NOI) for those activities disturbing 5 or more acres including those activities less than 5 acres, but are part of a common plan of development totaling 5 or more acres. A copy of the appropriate SWPPP and CSN or NOI shall be provided to the City of Anna prior to issuance of a grading permit.
2. The CSN or NOI shall be posted in a location viewable to the public until construction is complete and Notice of Termination (NOT) submitted. The Storm Water Pollution Prevention Plan (SWP3) shall be readily available for review by Federal, State, or local officials.
3. No soil disturbing activities will occur prior to the SWP3, ECP, and associated Best Management Practices (BMP) being fully implemented, and then inspected by Anna's Public Works Department.
4. The contractor shall comply with the current NCTCOG iSWMTM Technical Manual for Construction, the TPDES General Construction Permit TXR150000 and any other State and/or Local regulations.
5. The contractor shall employ measures as necessary to prevent dirt, mud, debris from being tracked off site. Any dirt, mud, debris tracked offsite shall be cleaned up by the contractor immediately.
6. The site shall be reviewed by the operator or his representative weekly, and after any major storm. Adjustments/repairs to the erosion control measures will be made as needed. The contractor shall notify Anna's Public Works Department of adjustments/repairs such that the adjustments/repairs may be inspected and approved by the City.
7. Along parkways and medians in the right-of-way, a four (4) foot strip of native sod shall be placed behind the curb on top of four (4) inches of topsoil. Contractor shall be responsible for any temporary irrigation or watering as needed. Areas adjacent to new residential lots, where the homebuilder will be disturbing this area, may be exempt from this requirement so long as adequate erosion control measures are installed and maintained behind the curb.
8. Contractor shall establish perennial vegetation on all other disturbed areas immediately upon completion of grading activities. An appropriate seed mix should be considered with respect to the season and the timing of final acceptance. A cool season seed mix should be used between September 15th and April 15th. Final acceptance of a site shall be contingent upon perennial vegetation being fully established in all disturbed areas.
9. A completed N.O.T. shall be submitted to the State and a copy of this N.O.T. shall be provided to the City of Anna prior to final acceptance.

GENERAL CONSTRUCTION NOTES
December 2012

111 N. Powell Parkway
Anna, Texas 75409
P (972) 924-3325
F (972) 924-2620

TREE PRESERVATION

1. Prior to construction, the contractor or subcontractor shall construct and maintain a protective fence at the drip line of all protected existing trees, bushes, landscaping plants, sprinklers, and lawns unless noted otherwise on the construction drawings. Any damage to the existing trees, bushes, landscaping plants, sprinklers, and lawns caused by construction shall be replaced to the satisfaction of the City of Anna at the contractor's expense.
2. All protective measures shall be in place prior to commencement of any site or grading work and remain in place until all exterior work has been completed.
3. The City's Public Works Department shall be contacted to approve the placement of the Tree Preservation fencing, prior to beginning of site work on property.
4. The following activities shall be prohibited within the limits of the primary root zone: Material storage, equipment cleaning/liquid disposal, no tree attachments of signs or wires, and construction equipment/vehicular traffic is prohibited.
5. Unless specifically allowed, no grade changes shall be allowed within the limits of the primary root zone of any protected tree unless the City approves adequate construction methods.
6. No trimming of trees may occur within the Tree Preservation fencing limits without prior consent of the City.

TRAFFIC CONTROL

1. When the normal function of the roadway is suspended through closure of any portion of the right-of-way, temporary construction work zone traffic control devices shall be installed to effectively guide the motoring public through the area. Consideration for road user safety, worker safety, and the efficiency of road user flow shall be an integral element of every traffic control zone. All traffic control devices shall be in accordance with the latest T.M.U.T.C.D. Devices must contain either Type III Hi-Intensity sheeting or Type IV reboundable Hi-Intensity sheeting.
2. Any traffic control plans not included in the engineering plan set must be submitted for review a minimum of seven (7) working days prior to the anticipated lane closure. Construction activity shall not begin until the traffic control plan is approved by the City of Anna. Traffic control plans may be required on other roadways as determined by the City or the designee. All traffic control plans must be prepared by an individual that is certified in their preparation. Any deviation from an approved traffic control plan must be reviewed by the City or their designated representative.
3. The contractor shall be responsible for maintaining all traffic control devices on an around-the-clock basis, whether or not work is active. Any deficiencies shall be corrected by the contractor immediately, regardless of time of day.
4. Lane closures will not be permitted on arterial roadways before 9:00 am or after 4:00 pm. Violations may result in suspension of all work at the job site for a minimum of 48-hours. The City reserves the right to deny a closure for a special event.
5. Lane closures will not be permitted on streets adjacent to private and/or public schools without written permission from the City.
6. All temporary traffic control devices shall be removed as soon as practical when they are no longer needed. When work is suspended for short periods of time at the end of the workday, temporary traffic control devices that are no longer appropriate shall be removed or covered. The first violation of this provision will result in a verbal warning to the construction foreman. Subsequent violations will result in suspension of all work at the job site for a minimum of 48-hours.
7. Existing permanent signs removed by the contractor for construction purposes other than stop, yield and street name signs shall be returned to the City of Anna. All stop, yield and street name signs removed shall be temporarily erected in the appropriate locations (no less than 7 feet vertical from grade) until permanent signing can be installed. Any temporary stop or yield sign locations to be left in place overnight will require prior approval from the City.
8. Any permanent sign or existing pavement markings that conflict with the approved traffic control plan shall be covered, obliterated or removed as directed by the City.
9. Access must be maintained to all drives and side streets or as indicated in the traffic control plan.

PEDESTRIAN ACCESSIBILITY (WITHIN PUBLIC R.O.W.)

1. All newly constructed sidewalks, curb ramps and crosswalks installed within City of Anna public rights-of-way shall be considered a pedestrian access route and shall conform to the most current "Draft" Guidelines for Public Rights-of-Way created by the United States Access Board. http://www.access-board.gov/prowac/draft.htm
2. Curb Ramps shall conform to all federal guidelines.
3. Detectable warning surface shall be pre-manufactured plates with truncated dome material built in. Only plates from TxDOT approved vendors shall be permitted and shall be installed per manufacturer's specifications. Brick pavers will not be allowed. Final color shall be approved by the City, but shall generally be in the "RED" color family.
4. The contractor shall provide a clear and safe route for pedestrians adjacent to the site for the duration of construction. A temporary pedestrian route shall be provided when any existing sidewalk is closed due to construction activity.
5. Construction materials shall be kept off existing sidewalks and consolidated in areas within the City right-of-way, unless otherwise approved by the City.
6. Sidewalks shall conform to all federal guidelines, but shall generally adhere to the following:
   a. Generally follow the street grade with a maximum 2.0% cross slope.
   b. Shall be free of any overhangs by landscaping or other items to a height of 7.0-feet.
   c. Sidewalks shall maintain a continuous (pedestrian access route) elevation through residential and commercial driveways.

WATER

1. Line and grade stakes for construction of all water and sanitary sewer lines and services shall be furnished by the following:
   a. Private Development: Developer's engineer, surveyor or their designated representative.
   b. Capital Improvement Projects: the Contractor, unless specified otherwise in the contract.

   Property lines and corners must be properly staked to verify the water line alignment. The City shall not be liable for improper alignment or delay of any kind caused by improper or inadequate surveys.
2. All new water services shall be 3/4" minimum DR-9 (250 psi) HDPE poly pipe with PE4710 as specified in ASTM F714, from the service tap to the curb stop, 3/4-inch minimum compression fitting angle stop, and meter box, unless otherwise indicated on the plans. Curb stops will be located within the meter box and facing toward the lot. For single family residential services the minimum meter size is ¾".
3. Each meter box shall be located adjacent to the curb and installed after street pavement has been completed and curbs backfilled. Meter boxes shall be Carson Valve and Meter Boxes. A 2" minimum metal locator plate shall be placed in the recess of the meters.
4. All water services shall be located along the lot lines. Single services shall be placed no more than 2-ft inside the service lot at the lot line.
5. Detector pads embedded in sand shall be installed above all service connections.
6. Each individual service location shall be sawcut into the face of the curb with a 4-inch high "W" painted by the Contractor. If no curb exists, a similar mark shall be placed in the pavement near the edge of the roadway. After cleaning the sawcut via compressed air or brush, apply one coat of APWA Blue spray paint to mark the sawcut symbol.
7. All water service lines shall be embedded with 12-inch sand below and around the pipe and 6-inches. of sand over the top of the pipe; from the water main to the meter. Water service lines within City roadway right-of-way shall be compacted to a minimum of the 95% Standard Proctor density with a +/- 3% wet of optimum moisture content.
8. All 6", 8" and 12" water mains shall be AWWA C900 PVC pipe or polywrapped ductile iron.
9. Minimum cover shall be 4 feet for 6-inch to 8-inch lines, 5 feet for 12-inch to 16-inch lines, and 6 feet for 20-inch and larger lines. Additional cover may be required in un-paved or un-developed areas.
10. Water mains in the right-of-way near storm inlets shall be constructed with a minimum clearance of 12 inches behind the inlet by pulling the pipe using longitudinal bending in accordance to 80% of the pipe manufacturers' requirements.
11. All blow-off (flush) valves shall be two (2) inch and shall be provided in accordance with City of Anna standards and/or NCTCOG standards.
12. Bolts and nuts for mechanical joints will be of a high-strength low-alloy corrosion resistant steel conforming to ASTM A325 (Type 3).
13. All waterline fittings shall be ductile iron. All 6" - 12" valves shall be AWWA approved resilient wedge gate valves.
14. In addition to thrust blocking, all fittings must be restrained and shall be Mega-lug.
15. Install 2' x 2' x 4" thick, concrete pad around all water valves outside of concrete pavement.
16. Valve extensions shall be provided on all valves with operating nuts greater than 5-ft below finished ground or paving grade.
17. All valves shall be marked with a "V" by sawcut on the curb or pavement The "V" shall point to the location of the valve as follows: If the valve is in the paving, the "V" shall be marked upright; if the valve is outside the paving, the "V" shall be marked upside down. After cleaning the sawcut via compressed air or brush, apply one coat of APWA Blue spray paint to mark the sawcut symbol.
18. NRS Resilient-Seated Gate Valves shall conform to AWWA C509 or AWWA C515. Rubber-Seated Butterfly Valves shall conform to AWWA C504. All valves shall have a 2" square operating nut and open to the left. All valves shall be Mueller, Clow or AVK.

STORM SEWER

1. When there is less than two feet of clearance between a water/sewer line and a storm sewer, the Contractor shall install concrete encasement around the sanitary sewer or waterlines at the storm sewer crossing. The encasement shall be a minimum of 10 L.F. and 6" thick centered at the crossing.
2. Manhole lids on storm sewer inlets shall be centered over the outgoing storm lateral.
3. All bends and wyes for pipes less than 42" diameter must be factory manufactured bends and wyes.
4. Inlet block-outs shall be placed three (3') feet from the back of standard curbs for the distance of ten (10') feet upstream (both sides in sag conditions) and five (5') feet downstream from the inside face of inlet. Inlet block-outs shall be placed five (5') feet downstream from the inside face of inlet, unless otherwise noted.
5. Structural concrete used for storm water structures shall be in compliance with the latest version of the NCTCOG standards and specifications.
6. Prior to final acceptance, all storm sewers shall be television filmed and cleared of any sediment and debris.

RETAINING WALLS

1. Retaining walls greater than 4 feet in height must be an engineered design by an engineer licensed in the State of Texas.
2. Retaining walls (including the footing) shall not be constructed to encroach upon City Right-of-Way, public easements, or public utilities without the consent of the City.

FIRE HYDRANTS

1. Fire hydrants shall be placed 3 feet from back of curb unless otherwise indicated on the plans, or as required to clear sidewalks. Fire hydrants shall not be located within a sidewalk.
2. Fire hydrants shall be three way breakaway type no less than 5¼ inches in size and must conform to AWWA specifications C-502. They shall be Mueller, Clow or approved equal with all bronze to bronze moving parts. Two 2½-inch NST hose connections are required. The 4-inch diameter steamer connection shall be 4.800 pitch with 4 threads per inch. The operating nut shall be 1½-inch P to F pentagon nut, open left. Mechanical joint connection is required. The steamer nozzle shall face the fire lane, adjacent roadway or as directed by the Fire Department.
3. A Blue Stimsonite, Fire-Lite reflector (or approved equal) shall be placed in the center of the street opposite each fire hydrant. The fire hydrant shall be painted with two coats of Tnemec Series 530 Omnithane paint or approved equal, and two coats of primer. Bonnet to flange and nozzle caps of Fire Hydrant to be painted with 2 coats of Tnemec Safety Paint Series 2H "Hi-Build". Fire hydrant color shall be red.

SANITARY SEWER

1. Line and grade stakes for construction of all water and sanitary sewer lines and services shall be furnished by the following:
   a. Private Development: Developer's engineer, surveyor or their designated representative.
   b. Capital Improvement Projects: The Contractor, unless specified otherwise in the contract.

   Property lines and corners must be properly staked to verify the sewer line alignment. The City shall not be liable for improper alignment or delay of any kind caused by improper or inadequate surveys.
2. Unless otherwise noted on the plans, all sanitary sewer pipes shall be PVC ASTM Designation D3034 up through 15" in diameter. Pipes larger than 15" in diameter shall be designated PVC ASTM F679. Other pipe shall be subject to Approval by the City.
3. All residential sanitary sewer services shall include a 4" tee wye bend, pipe and stopper, and shall be installed downstream from the water service at the lot centerline and extended 10' beyond the property line onto private property. Sewer services shall be laid on a minimum slope of +2.00% from the main line to the street right-of-way.
4. After curb and paving has been completed, contractor shall cut a four (4) inch high "S" on the curb indicating the location of the cleanout. After cleaning the sawcut via compressed air or brush, apply one coat of APWA Green paint to mark the sawcut symbol.
5. All sanitary sewers and services shall be tested by pulling a mandrel, air pressure test, and television video. The television video shall be provided to the City Inspector in a DVD format and shall be labeled accordingly for City record. Television survey shall be completed with water being introduced into the sewer line.
6. All sanitary sewer manholes within flood plains or flood prone areas require Type "S" manhole lids and be properly vented per TCEQ requirements.
7. All manholes shall be vacuum tested where a 10" mercury vacuum is developed. The air vacuum shall then be monitored for a test period of 2 minutes. The allowance drop in air vacuum shall be no greater than 1" mercury over the test period.
8. The Contractor shall install City of Anna standard wastewater manhole lids on all manholes.
9. Unless otherwise noted, in open spaces, the top of the sanitary sewer manhole shall be installed a minimum of 12 inches above the surrounding ground.
10. Structural concrete used for wastewater structures shall be in compliance with the latest version of the NCTCOG standards and specifications.

PAVING

1. All mix designs shall be sealed by a professional engineer and submitted to the City Inspector one week before a scheduled pour. Mix designs are subject to approval by the City.
2. All concrete paving shall have a minimum compressive strength of 3,600 psi, unless a higher compressive strength is specified.
3. All fill shall be compacted to 95% Standard Proctor Density in a maximum of 6" (six) inch lifts or per the approved Geotechnical Engineers Report. Subgrade shall extend 12" minimum behind the curb, be a minimum of 6" thick and shall be lime stabilized as recommended in the Geotechnical Report.
4. All streets, firelanes and alleys shall be placed on lime stabilized subgrade with lime content of not less than 6%. Lime stabilized subgrade shall be compacted to 95% of maximum standard proctor density (astmd698) within minus 2 to plus 4 of optimum moisture.
5. A subgrade density report must be presented to the City Inspector prior to paving. Densities are only valid for 72 hours. Densities received on a Friday are valid until noon on the following Monday. Densities taken before inclement weather may be required to be retaken at the City Inspector's discretion. A minimum of four (4) test cylinders are required for breaks at 7 days, 2 at 28 days, and the last cylinder being an extra.
6. All City streets are required to be paved with the use of an approved slip form paving machine with mechanical vibration. Hand pours are only allowed at intersection returns or other non-standard areas as approved by the City Inspector. Hand pours shall be vibrated by an approved hand vibrator.
7. Construction joints, cold joints and curb returns shall have fabric installed to allow for expansion.
8. Sawed joints shall be every 15 feet for 6" thick concrete and every 20 feet for 8" thick concrete; and shall be constructed within the first 12 hours of concrete placement.
9. Expansion joints shall be placed at a maximum every 400 feet.
10. All median noses shall be poured monolithically.
11. All Baffler Free Ramps shall comply with the current TDLR, ADA and TxDOT regulations.